The Journal

OF THE

AMERICAN DENTAL ASSOCIATION

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THE PRESERVATION AND CARE OF THE INTERPROXIMAL GUM TISSUE

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IN the last ten years, the dental profession has witnessed remarkable progress in the development of better dental materials, better technics, better methods of treatment and a better understanding of dental diseases. Indeed, this rapid progress makes it difficult for any dentist to keep abreast of the advancement that is constantly being made in his field. If it is difficult for a dentist to keep abreast of modern dental trends, think how far behind the layman must be! Too many people still think of dentistry as a mechanical trade, merchandising materials, rather than as a profession. This attitude of the layman prevents the average dentist from practicing his profession in the light of modern developments. It is perhaps true that, up to twenty years ago, dentists concerned themselves to a great extent with the mechanical side of dentistry, but today the modern dentist thinks in terms of dental health and practices prevention.

This preventive program stresses correct diagnosis through the use of the x-rays, pulp testing and transillumination. These measures also make it possible for a dentist to detect cavities when they are small or when they are in their incipiency, thereby preventing the unnecessary removal of a tooth, with the consequent drifting of the remaining teeth and traumatic occlusion, and with the loosening and opening of contacts that allow food to wedge between the teeth.

But prevention also takes into consideration the health of the gum tissue surrounding the teeth and alveolar bone, particularly the interproximal gum tissue; for, no matter how perfect a restoration, it is of little value if the gum tissue is diseased. If all the gum tissue about the necks of the teeth is diseased and infected, there is a considerable area from which bacteria and toxins can enter the blood stream. If it were possible to trace heart disease and certain types of cardiovascular disease, musculoskeletal defects and the mental and nervous diseases that caused the rejection of pros-

Read at the Seventy-Ninth Annual Midwinter Meeting of the Chicago Dental Society, February 23, 1943.

pective soldiers, it is possible that infected gums and teeth would be found responsible for a large percentage of these diseases. Such an investigation would show that the percentage of men rejected because of dental defects is much larger than 20.9 per cent.[1]

In World War I, many soldiers and civilians suffered from so-called trench mouth. This is considered a deficiency disease, and, in deficiency diseases, there is a tendency to gum inflammation, particularly in the free gingivae that bound the interproximal spaces.

On the other hand, I have observed cases of patients who were in perfect health according to the physician's report, but whose interproximal gum tissues were seriously inflamed, apparently because of the presence of heavy mucin plaques around the necks of the teeth.

Fig. 1.—Normal contacts.

Fig. 2.—Lower bicuspid and molar with contact points too high.

The presence of these mucin plaques, loaded with various types of organisms, exerts a toxic and irritative effect upon these tissues, producing chronic gingivitis and a tendency toward pyorrhea. These cases were not Vincent's infection, although some fusiform bacilli were present. Mucin plaques cannot always be seen and, because the teeth appear clean, many dentists are deceived and do not advise thorough prophylaxis. The gum tissue returns to normal shortly after the mucin plaques are removed and the gums treated. Often, one treatment is sufficient. This is in contrast to Vincent's infection, which usually requires many treatments over a period of two or more weeks. It seems to me that the mucin plaques contribute more to the contraction of Vincent's infection than does the deficiency disease.

It is evident that an unclean and unsanitary mouth condition, with the consequent chronic inflammation of the gum tissues, paves the way for the entrance of the organisms that cause Vincent's infection. A patient will not so readily contract Vincent's infection if the teeth are actually clean and the gum tissues in perfect health and there are no areas of inflammation or injury. This is an application of the principle that unbroken skin will ward off infectious organisms.

Fig. 3.—Upper first molar with contact point too low.

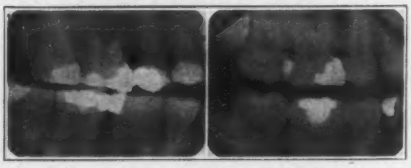

Fig. 4.—Bulging contacts, all proximal fillings.

The problem, then, as far as the military forces are concerned in World War

II, is the education of the members of our armed forces in the matter of correct and diligent oral hygiene. Each must be made to understand that unclean mouths, with mucin plaques and food particles lodged around the teeth, are responsible for much gum inflammation, which paves the way for trench mouth and pyorrhea, and that the mouth cannot be healthy and the teeth sound if the gums are unhealthy. This information, along with education in oral hygiene, must be given to the public at large.

If this can be accomplished, there will be a decided reduction of Vincent's infection among the military forces, whether in the trenches, in camps or with the fleet.

William Osler says:

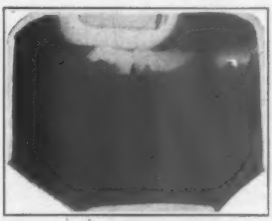

Fig. 5.—Destruction of bone from food packing between teeth and use of toothpick.

It (preventive dentistry) is the greatest service a dentist can render. There is not one single thing in preventive medicine that equals in importance mouth hygiene and preservation of the teeth.

Today, it is known that if the gum tissue surrounding the teeth is not healthy and does not remain so, perfect restorations will not prevent the loss of the teeth.

Most of the facts that I am pointing out regarding the preservation and care of the interproximal gum tissue are exceedingly important if we as a profession are to serve the best interests of the patient. It is our obligation to so carry out operative procedures that gum tissues are protected from injury at all times; for it is in the field of operative dentistry that much of the damage to interproximal tissue is brought about.

Every dentist is familiar with the harm that can result from adherence of salivary and serumal calculus to the teeth in causing inflammation and destruction of gum tissue, but every dentist does not realize the potential damage or injury to gum tissue that may result from careless methods in the mechanical procedure followed in restoring tooth form by replacing tooth structure lost by decay. Tooth form is exceedingly important. While restoration of the occlusal, lingual and buccal forms of teeth is necessary for protection of the free gingivae from the harsh impact of food against them, restoration of the form of the mesial and distal surfaces of teeth is of greater importance in the protection of interproximal gum tissue. If the correct form of the mesial and distal surfaces is obtained, the proper contact is also obtained, except when the tooth form must be built out to obtain tight contact. G. V. Black,[2] in 1915, called attention to proper and improper contacts, describing (1) normal contact, (2) too high contact, (3) too low contact and (4) contacts bulging too far gingivally.

When contact points bulge too far in one direction gingivally, a normal healthy interproximal tissue is forced out of place or even pinched so that normal circulation is obstructed. (Fig. 1.)

Slight contacts, which permit food to be forced between the teeth upon the interproximal gum tissue, will lead to inflammation and destruction of this gum tissue. Under these conditions, formation of a pocket is inevitable, and, in time, the loss of one tooth or both teeth is certain. In such a case, in order to preserve the interproximal gum tissue, steps must be taken to make a correct and tight contact, whether the

restoration is made in a carious tooth or a sound tooth, and this tight contact must be maintained.

In the everyday practice of operative dentistry, carelessness in the use of the following devices and materials can cause irreparable damage to the interproximal gum tissue: (1) burs, (2) Joe Dandy stones, (3) jaws of separators, (4) rubber dam clamps, (5) matrices and copper bands, (6) toothpicks, (7) dental floss, (8) gutta-percha fillings and (9) overhanging fillings and crowns.

Any one of these devices or materials can be the source of great harm if used injudiciously or carelessly. Particularly is this true in those mouths that are unclean or septic or in which the gum tissue is already inflamed. Of course, the injured tissues may heal and return to a condition approaching the normal because of the abundant supply of blood that nature has provided for these tissues. In many cases, however, these interproximal tissues are infected and the condition becomes the predisposing cause of future serious gum disease.

It is inexcusable, in preparation of the mesial or distal cavity, to allow a rapidly revolving bur to slip into the interproximal space, cutting and tearing the investing tissues at this point. Often, the peridental membrane is damaged and the surface of the tooth roughened at the side of attachment.

Joe Dandy disks have been known to lacerate and, on some occasions, sear the interproximal gum tissue as well as the peridental membrane.

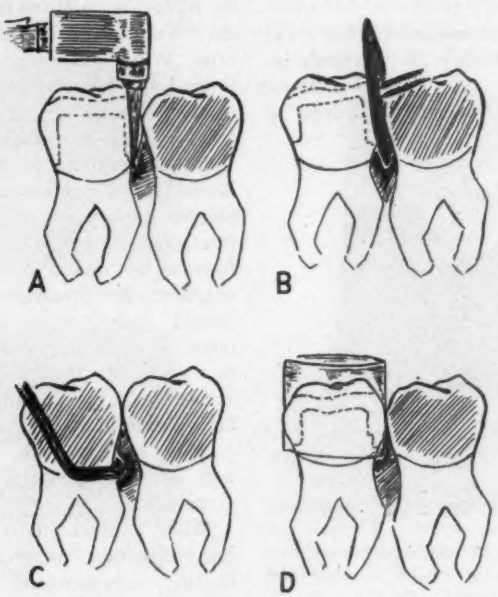

Fig. 6.—Curve of gingival line on proximal surfaces; relation of ligature to attachment of soft tissue at summit of arch as it passes labiolingually; position of ligature in relation to interproximal attachment of soft tissue of tooth. When the band is firmly drawn and pushed to the gingiva as far as shown, the cutting of the attachment of soft tissues to the neck of the tooth is certain. A, bur in tissue. B, disk. C, jaws of separator. D, copper band on tissue.

The jaws of separators can slip down upon the interproximal gum tissue, not only injuring this tissue, but also actually stripping the peridental membrane from the tooth. Matrices and bands must be cut in such a way that they will not cut into the gum tissue or injure the peridental membrane.

Toothpicks forced into the interproximal space and wedged between the teeth to hold matrices against the gingival margin of a cavity can injure the interproximal gum tissue.

Many years ago, G. V. Black[8] called attention to incurable diseases of the peridental membrane of the anterior teeth that he had traced to an initial lesion caused by the use of dental floss as a ligature. He described the normal attachment of the gum to the tooth at the gingival line and showed how this line arched on the mesial and distal surfaces. If a ligature is tied so tightly that it cuts the tissue at the crest of the arch, irreparable damage may be done. When floss used to clean the interproximal surfaces of the teeth is allowed to snap upon the interproximal gum tissue, often inflammation and destruction of this tissue result, leading to pocket formation. I do not approve or prescribe the use of floss by the layman. Very few can use it in the correct manner. Most dentists who advocate the use of floss do so with the idea that the floss will clean the contact points. If the contacts are sufficiently tight, food is prevented from wedging between the teeth, and if they are not, they should be restored, and if the interproximal gum tissue is healthy and occupies its normal space, there should be no need for using dental floss.

If we consider the matter, we find that most contact points are self-cleansing because of the movement of the tooth in the socket. If this were not true, there would be no wear of the contact points over a period of years. Then, too, it may be observed that decay usually starts immediately below the contact points on the lower teeth and above the contact points on the upper teeth. But immediately below or above the contact points, it is quite difficult for floss to pass over these surfaces, which are concave in varying degrees. The result is that the floss, while it does pass over the contact point, fails to clean the surface above or below, and the surfaces that it passes over are the mesiobuccal and distobuccal angles. These surfaces are easier to clean with a toothbrush than with dental floss. The good done by passing floss through the contacts is not commensurate with the potential danger to the interproximal gum tissue.

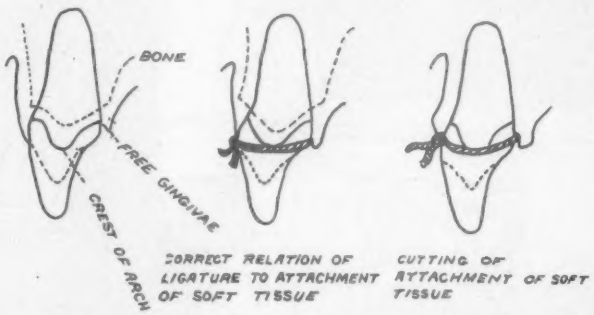
BONE
FREE GINGIVAE
CREST OF ARCH
CORRECT RELATION OF LIGATURE TO ATTACHMENT OF SOFT TISSUE
CUTTING OF ATTACHMENT OF SOFT TISSUE

Fig. 7.—Correct position of ligature to contact points for passing between teeth; incorrect way; damage to interproximal soft tissue and free gingivae when ligature is allowed to snap against them.

Crowns that are too large for the teeth which they cover and which press upon the gum tissue are potent sources of constant gum inflammation. Particularly is this true in the interproximal space where the interproximal gum tissue is pushed down or crowded away from the tooth surface which it would normally cover. Overhanging fillings have the same harmful effect as oversized crowns.

One law of operative dentistry decrees that in restorations all surfaces be smooth and flush with the margins of the cavity. This law must be observed very carefully in the mesial and distal surfaces if interproximal gum tissue is to remain firm and healthy. Care must be exercised in the placing of gutta-percha in proximal cavities so that the filling will not press on the interproximal gum tissue and cause inflammation. Irreparable damage can be done by the careless insertion of this type of temporary filling.

Since this paper is concerned with the prevention of damage and with the care of the interproximal gum tissue, no mention has been made of traumatic occlusion or systemic conditions such as autointoxication, diabetes mellitus and blood dyscrasia. It is taken for granted that traumatic occlusion and these systemic diseases will be recognized and correctly treated.

At the beginning of this paper, mention was made of the damage done by food wedging between the teeth, and of the part calculus plays in injuring the interproximal gum tissue. It was taken for granted that every dentist realizes the importance of removal of calculus and the necessity for clean, smooth tooth surfaces. However, in the care of interproximal gum tissue, a clearer explanation is necessary. In many cases, the teeth will become firm and the contact will tighten when calculus has been removed and the gum tissue brought back to health. To keep the tissues in this condition, calculus must be removed whenever it forms.

There are cases in which there has

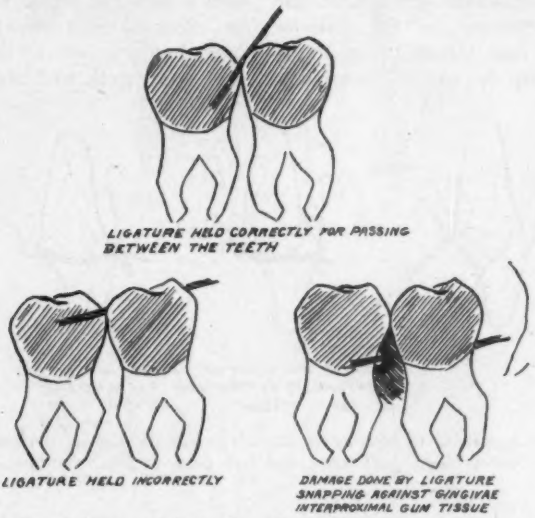
LIGATURE HELD CORRECTLY FOR PASSING BETWEEN THE TEETH
LIGATURE HELD INCORRECTLY
DAMAGE DONE BY LIGATURE SNAPPING AGAINST GINGIVAE INTERPROXIMAL GUM TISSUE

Fig. 8.—Destruction of bone and formation of pocket between two upper separated central incisors, due to impact of food upon soft tissue; two three-quarter inlays soldered together to act as splint for mutual support and to prevent impact of food upon interproximal gum tissue.

been destruction of interproximal gum tissue as well as bone, with formation of pockets. In these cases, the teeth may become firm, even though the contacts may be loose or even lost, and food wedge between the teeth. In such cases, after restoration of the proximal surfaces of the teeth to restore tightened contacts, the latter often become loose, in the course of time. Regardless of the type of oral hygiene adopted, and the treatment prescribed, the continual packing of food between the teeth handicaps the patient and the dentist in their endeavors to maintain health of the gums. The action of this wedging food not only causes further destruction of the interproximal gum tissue, but also maintains a constant state of inflammation of the gums and prevents healing. To safeguard and preserve the interproximal gum tissue, interproximal contacts must be obtained and maintained. The technic is simple and the results are excellent.

Fig. 9.—Above: Separated central incisors with deep pocket. Below: Gold splint made by soldering two three-quarter inlays together.

After the gum tissues have been restored to health, by either mechanical or medicinal means, or both, the problem of maintaining this healthy tone centers almost entirely on the maintenance of tight contacts, the prevention of food packing between the teeth, and the support and rest of the teeth undermined by periodontoclasia. The support and rest of such teeth can be secured by soldering together the contacts of three-quarter inlays fitted in anterior teeth and, in the case of posterior teeth, by a dovetail rest lug soldered to one inlay, and by resting the dovetail in the depression made in the adjacent inlay.[4]

Broken stress inlays can be constructed for all posterior teeth. The technic for these inlays is as follows:

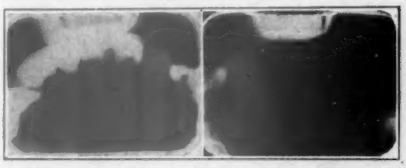

Fig. 10.—Left: Anterior teeth when patient was first seen, in 1928. Right: Splint made by soldering three-quarter inlays together (1941).

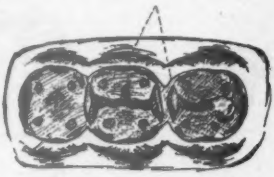

Fig. 11.—Inlays accurately positioned in impression.

1. Inlays are constructed for the teeth involved, fitted to place and made to occlude correctly. I prefer the indirect method, making use of copper plated dies.

2. Impressions of the teeth with the inlays in place are taken in "solvite." The inlays are removed from the teeth and placed in position in the copper dies. The dies are either fitted into the impression and run in stone or the inlays are placed in the impression, oiled to facilitate removal and then run in "diolite" or stone.

3. When the investment is hard, a dovetail is made in one of the inlays.

4. A wax impression to conform to the dovetail in the inlay and its relation to the other inlay is made and cast. This dovetail should be made in the inlay of the tooth that has the strongest supporting structures.

5. The cast gold dovetail is assembled, waxed to the approximating inlay, removed from the die, invested and soldered.

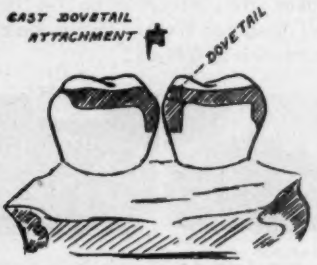

Fig. 12.—Inlays in proper position as to each other on model; dovetail made in one inlay.

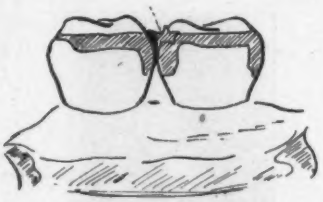

Fig. 13.—Dovetail attachment waxed to inlay before investment for soldering.

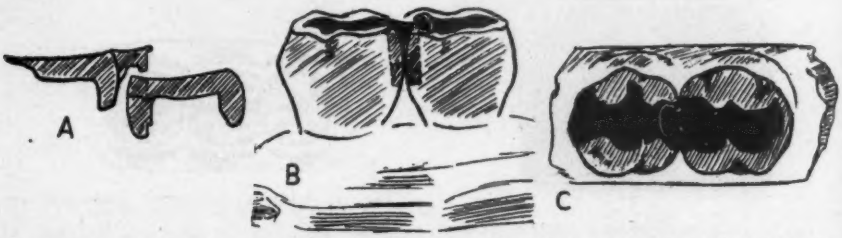

Fig. 14.—Left: Appearance of inlays, showing relationship to each other, after soldering dovetail attachment. Center: Lateral view of inlays. Right: Occlusal view of inlays.

6. The proximal and occlusal surfaces are polished as for a single inlay.

With the restoration and maintenance of interproximal contacts, the interproximal gum tissue will often make an effort to fill the interproximal space. I believe that some regeneration of bone takes place.

In those cases in which the interproximal gum tissue has been destroyed, after the application of the technic suggested for maintaining contacts, and the interproximal space is open between the teeth, allowing food to enter, the question is often asked, "How can these tooth surfaces be kept clean?" Such questions are usually asked by those dentists who prescribe the use of floss or suggest a toothpick for the purpose of cleaning these surfaces. It is obvious that floss cannot be passed between these teeth and that a toothpick is too hard for the purpose.

If all the factors in the health of the interproximal gum tissue have been given proper attention, and these tissues restored to a healthy tone, it is not too difficult for the patient to learn a system of oral hygiene that will enable him to maintain this condition and retain his teeth for many years.

I do not prescribe the use of a toothpick for gum stimulation or of dental floss for cleaning the contact points for the reasons already given. If the contacts have been tightened, the patient is told that it is possible for them to become loose so that food can wedge between the teeth. The patient is asked to notify

me immediately of such an occurrence. If this happens, steps are immediately taken, in accordance with the technic previously outlined, to maintain the interproximal contact. For stimulation of all the gums, including the interproximal gum tissue, the patient is instructed in the use of the "denticator." The rubber cup on the "denticator" acts with a suction effect. When placed against the gum tissue, it forces out the blood of these tissues, blanching them. When released, fresh blood rushes into the tissues. The soft rubber tip may also be used to clean the interproximal surfaces of the teeth. This rubber point is used in those cases in which the interproximal gum tissue has not returned to normal position and an open space remains between the teeth.

After the patient has cleaned the teeth with the toothbrush and stimulated the gums with the "denticator," he is instructed in the use of a solution of sodium chloride. He is told to hold the solution in the mouth for at least a minute, forcing it against the gums and between the teeth with as much pressure as he can produce with the tongue and cheek muscles. The beneficial effect of this treatment on the gums is gratifying. The surprising results obtained by correct treatment of borderline or virtually hopeless cases have often seemed miraculous. I have seen such patients who have retained the teeth and the health of the gums twenty-five years after the initial treatment. Of course, great credit is due them for their faithful cooperation.

This paper has been concerned with pointing out the danger that may be done to interproximal gum tissue by careless operative procedures and the careless use of devices and materials; the importance of proper restoration of the contacts that protect interproximal tissue; the technic necessary for the protection of interproximal tissue by means of broken stress inlays, and the importance of maintaining the health of the gums by proper cleaning of the teeth, avoiding the use of toothpicks and dental floss for the removal of food packed between the teeth.

Since sound teeth and healthy gums have an important bearing on health, it is particularly important in these days of stress that the public be made aware of the great danger that lurks in diseased gums. Men are rendered inefficient, countless man-hours are lost in vital defense industries and innumerable warriors are lost to the service or incapacitated for active duty because of ignorance concerning this important health factor.

It, therefore, behooves us to teach, day in and day out, that one of the easiest routes for bacteria to the blood stream is through the gum tissue, and that he who would avoid trench mouth, pyorrhea, rheumatism, heart disease and other ailments and insure his future health will have his gums in a condition of good health.

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CLAMPING AND GRINDING HABITS; THEIR RELATION TO PERIODONTAL DISEASE

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THE treatment of periodontal disease is based upon the control and elimination of the known factors causing the periodontal breakdown in each case. There are, frequently, unknown systemic factors which we cannot control. Let us consider a known factor which consistently remains unrecognized and uncontrolled in periodontal management, and whose importance cannot be overemphasized: the habit of clamping and grinding of the teeth, often referred to as bruxism or bruxomania.

Stillman,[1] Sorrin,[2] Miller[3] and Boyens[4] have listed types of habits that are etiologic factors in periodontal disease. More than twelve years of clinical observation has demonstrated that the majority of periodontal cases have, as a significant factor, some pressure habit or habits, either as an initial or as a contributory cause. To insure sustained success in completed cases involving periodontal problems, clamping and grinding habits must be diagnosed and controlled.

NORMAL FUNCTION OF PERIODONTAL MEMBRANE

In order to determine what is harmful in the habit of clamping and grinding, diurnal or nocturnal, it is essential to have a clear knowledge of the physiology of the normal periodontal membrane. The periodontal membrane functions as a cushion between the inelastic tooth and the comparatively inelastic alveolar bone. It supports the tooth in its position against movement through the pull of its fibers in one area, combined with resistance to compression of the membrane in an opposing area. When we chew food and bite on the teeth with 40 to 150 pounds pressure per square inch, the food cushions the shock slightly, but when the force reaches the tooth, it is the periodontal membrane alone that cushions the shock; i.e., gives under the force. In normal chewing, there is a combination of the lateral motions and the vertical or up-and-down motions of the jaw. This vertical motion is responsible for the intermittent quality of the force upon the tooth. In this momentary contact and release of normal function, the fibers of the periodontal membrane are intermittently stretched and released and the thickness of the periodontal membrane increases and decreases as the tooth moves in function. This normal function is conducive to the health of the periodontal membrane.

PATHOLOGY

In the habit of clamping and grinding, which manifests itself with numerous variations, the force applied to the tooth is almost always sustained rather than intermittent. Under the sustained pressure, groups of periodontal fibers are under constant tension without release or rest. In opposing areas, the periodontal membrane is compressed for periods of time without release. This prolonged tension and compression may cause congestion and irritation of the periodontal membrane as differentiated from the stimulating effect of the intermittent force. The repeated forces of habit origin can, in time, seriously damage the periodontal membrane, causing

periodontal disease, or they may become a secondary factor in an already existing periodontal disease.

Orthodontic researches[5, 6] have proved that light sustained force, i.e, in ounces, will cause tooth movement without development of pathosis in the periodontal membrane. However, when the sustained pressure of an orthodontic appliance is increased beyond a certain amount, there is destruction of the periodontal membrane or resorption of the root and possibly destruction of the alveolar bone. Yet the amount of sustained pressure which these studies have shown to be dangerous to the periodontal membrane is only a small fraction of the pounds per square inch applied in the habits that we are discussing. The slight amount of this pressure leads to the conclusion that it is the sustained quality of the pressure in the clamping or grinding habit that is its most harmful characteristic.

Three characteristics of the force relayed to the periodontal membrane in clamping or grinding habits differentiate it from normal function: 1. The constancy of the force (the fact that it is not intermittent). 2. The excessive force in pounds. (a) Total muscular force may be applied on a small group of teeth because of extractions or the particular character and direction of the habit and (b) the muscle strength of the individual may be overdeveloped as a result of the clamping and grinding habit. 3. The excessive time per day that the force is applied.

WHAT ARE CLAMPING AND GRINDING HABITS?

In normal function, there is occlusal contact between the upper and lower teeth during mastication of food and during swallowing. There is also occasional light contact during speech. Except for the above-mentioned contacts, all repeated or sustained contact or pressure of the teeth of the mandible against the teeth of the maxillae should be regarded as a clamping or grinding habit.

The generally accepted conception that clamping and grinding habits are practiced only during sleep is fallacious.

TABLE 1.—INCIDENCE OF HABITS IN 171 PERIODONTAL CASES*

Type of Habit	Occurring Only During Waking Hours		Occurring Only During Sleep		Occurring During Both Sleep and Waking Hours		Total Occurrence Regardless of Time of Day	
	No.	Per Cent	No.	Per Cent	No.	Per Cent	No.	Per Cent
Clamping	32	19.7	12	7	107	62.9	151	88.3
Grinding	6	3.5	16	9	66	38.6	88	52.4
Clicking	6	3.5	0	0	0	0	6	3.5
Teeth involved with foreign object	4	2.3	0	0	2	1.2	6	3.5
Teeth involved with other parts of the body	28	17.0	0	0	12	7.0	40	23.4

When two habits exist in the same case, they are listed as two habits. Hence a total of more than 100 per cent.

*All of the 171 periodontal cases had habit involvements. Periodontal cases without habit involvements are not included in the tables. Tables 1 to 6 present the results obtained from 171 cases in the private practice of the author. These cases and others with less complete histories form the basis of the opinions and procedures expressed in the text of the paper.

These habits may be indulged in at any time during the day or night. According to the interpretation of the term bruxism, grinding is brought about by the subconscious mind during sleep, when we are overwrought or extremely worried. Observation has indicated how limited and narrow is this interpretation. We cannot relegate either of these hyperfunctions to nocturnal activities. Patients develop habits which they indulge in in the daytime as often as in the night. It is not the function of this paper to discuss the initial psychologic or local causes of these habits, but rather to impress upon the practitioner the fact that such habits exist and are detrimental to the patient's oral welfare. Whether a case is orthodontic, prosthetic or periodontal or a simple operative procedure, the practitioner must constantly be aware, in his diagnosis, that the habits of the patient are linked to the successful outcome of the treatment. Unless the practitioner understands the damage, potential or actual, brought about by pressure habits and the need for eliminating or obviating them, he will find himself hindered in the treatment undertaken.

While clamping and grinding may be described generally, and while there are certain standard groups or types of habits, it must be remembered that actually such habits are as multiple and varied as are the individuals who indulge in them. Nevertheless certain rules can be advanced for their recognition.

CLASSIFICATION OF HABITS

Mouth habits related to periodontal disease can be classified as follows:

Class 1. Habits involving a foreign object: pipe biting, thread biting, pencil biting, nail holding (cobbler's teeth), opening of bobby pins with the teeth, etc. Sorrin's[2] habit classification is excellent for Class 1. Biting of foreign objects has received adequate attention. These habits are rather obvious. Checking their existence is a simple matter of consultation with the patient.

Class 2. Habits involving the teeth and other tissues: lip biting, cheek biting, sucking on the teeth, sucking of lips, sucking of cheek or finger, fingernail biting and pressure with the tongue on the teeth. These habits, though harmful, do not generally involve heavy pressure and are therefore less significant periodontally than Class 3.

Class 3: Clamping and grinding habits involving perversion of the occlusal function. It is this class which is clinically

TABLE 2.—INCIDENCE OF SINGLE AND MULTIPLE HABITS IN 171 PERIODONTAL CASES*

Type of Habit	Occurring Only During Waking Hours		Occurring Only During Sleep		Occurring During Both Sleep and Waking Hours		Total Occurrence Regardless of Time of Day	
	No.	Per Cent	No.	Per Cent	No.	Per Cent	No.	Per Cent
Clamping	14	8.2	8	4.7	27	15.7	49	28.6
Grinding	4	2.3	0	0	7	4.1	11	6.4
Teeth involved with foreign object	1	0.6	0	0	0	0	1	0.6
Teeth involved with other parts of the body	2	1.2	0	0	0	0	2	1.2
Combinations of more than one type of habit	10	5.8	3	1.8	95	55.6	108	63.2

*The larger group is involved with multiple habits.

most common and which has been most neglected. The unconscious habits of Class 3 are less obvious and consequently harder to disclose than the habits of Class 1 and 2. The following subclassifications will be helpful in the detection of a patient's habits.

A. Clamping; day or night.

1. In the position of centric occlusion.

(a) Direct vertical pressure on molars.

(b) Upward and outward pressure on upper anterior teeth without moving out of centric relation.

(c) Direct forward push on upper anterior teeth with lower anterior teeth.

(d) Unilateral diagonal pressure on either left or right posterior teeth.

(e) Alternating pressure without moving out of centric relation on right molar segment and then on left molar segment.

(b) Pressure on small groups or individual posterior teeth in lateral excursion.

B. Grinding, day or night.

1. About 1 mm. movement in each lateral excursion alternately.

2. Extensive movements in each lateral excursion alternately.

3. Grinding from centric relation into one lateral excursion and back to centric relation, repeating that motion.

4. Sliding from centric relation into protrusive relation and back, bearing only on anterior teeth.

5. Lateral movement in protrusive position bearing only on anterior teeth in an edge-to-edge relation. This is a common habit and is very damaging to the incisor teeth.

6. Complicated and irregular movements with the lower anterior teeth on the lingual surfaces of the upper anterior teeth.

C. Clicking, day or night. Rhythmic clicking or tapping of the teeth is not a frequent habit. The teeth of one jaw are clicked against the teeth of the other in a rhythmic fashion creating somewhat the effect of teeth chattering when one is shivering.

1. Clicking of teeth in centric relation.

2. Clicking of anterior teeth edge-to-edge.

3. Clicking on one tooth or small blocks of teeth.

4. Clicking in any of the three foregoing methods in rhythmic time to music.

As a rule, clamping is more injurious than grinding, owing to the fact that the

TABLE 3.—INCIDENCE OF CONSCIOUSNESS OF HABIT EXISTENCE AT INITIAL INTERVIEW IN 171 PERIODONTAL CASES

	Number	Per Cent
Patients not conscious of habit existence	138	80.7
Patients vaguely conscious of habit existence	14	8.2
Patients conscious of habit in detail	19	11.1

This may be performed so as to rock the teeth in their sockets rhythmically, without leaving centric occlusion.

(f) Sustained vertical pressure on all teeth of the arch. The patient can also effect this pressure by sitting or lying, supporting the head by resting his chin in the palm of the hand or by sleeping with the chin in the pillow.

(g) Pulsating vertical pressure on all teeth with no movement. This is accomplished by rhythmic contractions of the masseter and temporal muscles. It is a common habit and can be detected by the rhythmic play of the cheek in the region of the masseter.

2. Clamping in other than centric occlusion.

(a) Pressure on incisor teeth in the protrusive relation.

character of the forces involved in clamping make it a further digression from normal than the forces involved in grinding. In some cases of excessive grinding, the hyperfunction may even result in a periodontal condition of greater health than average; i.e., greater density of alveolar bone and better health of the gingival margins in an adult. This does not occur with clamping.

DIAGNOSIS

The control of clamping and grinding habits is a psychosomatic problem. We should suspect and look for habits in almost every case of periodontal disease. We must also check for habits in other problems arising in dentistry when the usual causes for irritation and pain do not suffice to account for the condition. As a part of a complete dental examination, which includes the usual full-mouth roentgenograms and diagnostic models, a check on the possibility of existing habits should be routine. Such a check, however, cannot be made in a single visit. An efficient procedure is a study of the problem at appointments while other treatments are given.

First Visit.—After we have taken routine complete mouth roentgenograms and impressions for diagnostic models, the patient is asked directly whether he is conscious of any clamping or grinding habits. The direct questions, "Do you clamp your teeth? Do you grind your teeth?" are employed. In a small percentage of cases, the answer is in the affirmative. Usually, however, the patient is puzzled and cannot answer, or emphatically denies the possibility of any habits. This response should not deter the practitioner. A brief explanation is offered the patient. The condition of his mouth warrants suspicion regarding habits. The patient is told that many persons have habits of which they are unconscious, and that the unconscious existence of a habit is no indication of wrong doing. The explanation that such habits are common and can be eliminated by conscious effort often aids the patient in overcoming any mental resistance which might hinder an attempt to disclose the habits. It also tends to create in the patient a realization of the damage that he may be causing his teeth through unknown habits. It will arouse his curiosity and interest and thereby lead to his cooperation.

TABLE 4.—INCIDENCE OF CONSCIOUSNESS OF HABIT SUBSEQUENT TO DIAGNOSIS IN 171 PERIODONTAL CASES

Patient's Report		Number	Per Cent
Conscious of habit or habits by third visit. (This includes patients who were conscious of habit at initial interview)	Accurately	119	69.6
	Vaguely	8	4.6
Conscious of day habit by third visit. (Patient became aware of night habits one or two months later)		6	3.5
Conscious of night habit by third visit. (Patient became aware of day habit three to six weeks later)		6	3.5
Denial of habits for about two months and then conscious of their existence		17	10.1
Persistent denial of habits with voluntary admission of habit one-half year later upon return for check-up treatment		15	8.7

The patient is told that we are seeking full and detailed information concerning possible habits. He is asked to spend a week carefully checking and studying everything that he does with the mouth and teeth outside of the actual chewing of food. By assuming the rôle of a vigilant and impartial observer, the patient may be able to clearly establish in his conscious mind all the habits in which he may be indulging unconsciously. He is instructed to note how he clamps or grinds his teeth and when and how much he clamps or grinds, and whether it is during the day or night or in both periods. He is to report on what he associates with the habits; i.e., whether he clamps or grinds when he is tired or angry or when he is emotionally disturbed, or whether the habit is indulged in only while he is concentrating on a problem in his work.

The patient is further requested not to make any attempts to control or change the habits during the week of observation. Such an attempt would simply confuse attempts at clarification of the habits. To aid him in his observation, the physiologic rest position is demonstrated to him in the following manner. He is asked to swallow. On completion of the swallowing reflex, he is to note the relation of the upper teeth to the lower teeth, of the tongue to the teeth and the position of the lips. After he has repeated this several times, the patient verbally describes the positions that he has noted. When he is able, without the aid of a mirror, to say that the teeth of the two jaws are separated by a slight space and the tongue rests lightly against the lingual surfaces of the lower anterior teeth, he is told that he has established the normal rest position. He is instructed to consider any repeated deviations from this rest position, at times other than when masticating food or speaking, as an indication of a habit.

Second Visit.—With the aid of the roentgenograms and the diagnostic models the patient's mouth is examined and charted, the periodontal condition recorded and tooth mobility analyzed and noted. The question of mouth habits is then discussed. It is at this point that the practitioner is called upon to utilize his thorough understanding of the occlusal factor in the etiology of the periodontal disease.

The larger group of periodontal cases present an etiologic picture wherein local irritational factors, calculus, bad fillings, etc., are not the whole story. These cases present missing teeth, tilted teeth, deep overbite, mutilated occlusion,

TABLE 5.—INCIDENCE OF HABIT CONTROL DURING TREATMENT OF 171 PERIODONTAL CASES

Type of Control		Number	Per Cent
Complete control	Within 2-3 weeks	6	3.5
	Within 3-12 weeks	77	45.1
Control of day habits (splint needed for night control)		13	7.6
Control of day habits with only partial control of night habits		7	4.1
Control of habits with minor recurrences		31	18.1
Diminution of habits		32	18.7
Failure of control		5	2.9

excessive cuspal inclination, excessively large cuspal contactual surfaces and many other forms of traumatogenic occlusion, for which a more inclusive term is hyperocclusal stress. In these cases, owing to irregularity of the teeth and their cuspal planes, functional occlusion has been lost. Simultaneously, there develops hyperfunction of certain or all remaining teeth.

The reduction of hyperocclusal stress through occlusal equilibration or an entire change of the occlusal relation through occlusal reconstruction is indicated. *Having decided that hyperocclusal stress is an important etiologic factor in a particular case, the operator must utilize every method to reduce that stress. This means not only alteration of the occlusal relation, but also habit control.* Occlusal equilibration will reduce the damage of a habit by reducing the stress involved. Scaling, curettage or gingivectomy may also reduce the clamping habits in many cases in which the periodontal condition may have been the activating factor in the habits.

In those cases in which the amount of the supporting structure is far less than normal, owing either to a reduced number of remaining teeth or to a loss of a goodly portion of the alveolar support, normal occlusal stress can no longer be regarded as physiologic for this reduced supporting structure. Under such conditions, only a reduced stress becomes physiologic or compatible with the health of these reduced structures. This reduced stress can be created by altering the occlusal surfaces of the teeth and reducing the anterior overbite. It can readily be seen that any continued clamping or grinding on these reduced structures will undermine them at a rapid rate.

TABLE 6.—INCIDENCE OF HABIT CONTROL IN 171 PERIODONTAL CASES OBSERVED FROM ONE TO TEN YEARS AFTER COMPLETION OF TREATMENT

Status of Control	After 1-2 Years		After 2-5 Years		After 5-10 Years	
	Number	Per Cent	Number	Per Cent	Number	Per Cent
Complete control, no recurrences	13	7.6	34	19.9	10	5.9
Single or periodic minor recurrences of short duration. (Patient able to reestablish control unaided.)	0	0	22	12.9	11	6.4
Recurrences which needed practitioners aid for reestablishment of control	2	1.2	15	8.8	11	6.4
Diminution of habits with no complete control	6	3.5	23	13.5	20	11.6
No control at all	0	0	4	2.3	0	0

With the factors concerning the relation of occlusal stress to periodontal disease firmly in mind, the patient's detailed report is analyzed and recorded. A description of what he does is not sufficient. An actual demonstration, by the patient, of how he clamps or grinds is necessary. This enables the practitioner to relate the forces involved in the particular habits to the character of the patient's own periodontal problem. For example, when a patient presents a condition of considerable bone loss in the incisal area, with no other visible periodontal damage and his habit is that of

clamping on the edges of the incisor teeth, greater importance can be ascribed to this habit than to some other habits that he may present. Further, the actual physical demonstration by the patient is instrumental in bringing the habit out of the subconscious and fixing it in the conscious mind; which makes conscious control of the habit easier for the patient.

In some cases, the patient may report a few habits, but the practitioner may believe that they are of minor importance in the problem at hand. The practitioner may suspect a lack of observation or a vague understanding of what a habit is, or simply that he has a resistant patient. It is in place at this point, in order to arouse the patient's interest, to suggest and demonstrate possible habits or mannerisms to the patient. In all cases, if the patient's report is not thorough and clearly defined, the discussions should continue during subsequent visits while the initial work on the case is going on.

After one week of observation, however, the patient is usually conscious of daytime habits. His difficulty comes with an attempt to recognize and describe night habits. During the day, he finds that he can readily catch himself in action, or he will have his attention directed to his habits by a friend or a member of his family. At night, he falls asleep and is unable to furnish any information. He is asked to continue his observation and is told more precisely what to look for. Where there is doubt concerning night habits, he is asked to check for the following symptoms at the moment of awaking:

1. Are the teeth in contact or is there a free space?
2. Is there a consciousness of the teeth in any way?
3. Is there a throbbing soreness of the teeth which disappears a few minutes after he is fully awake?
4. Is there a sensation of looseness of the teeth? (This is more of a sensation than an actual looseness.)
5. Is there a feeling of tension in the maxillae in the region of the antra?
6. Do the muscles of mastication (masseter and temporal) feel strained or tired?
7. Is there a consciousness of the temporomandibular joint?

The existence of even a small group of these symptoms is usually proof that the patient has been clamping or grinding. However, the absence of all of these symptoms is not conclusive evidence that habits do not exist. Often, in nocturnal grinding, the noise of the gritting and sliding of the teeth is quite audible, so that some one sleeping near the patient can easily discover the habit. Where the patient may be a "clamper," we ask that he have some one gently part his lips while he is asleep and note the position of his teeth.

Third Visit.—At this visit, the patient's entire dental problem is outlined. A program of treatment is presented and explained. This program includes restorative, periodontal and other necessary measures. The question of habit control is brought in as one part of the periodontal therapy.

By the third visit, the practitioner is usually satisfied that the patient has become sufficiently conscious of his habits. The patient is informed that the time has come for him to make a conscious effort to control his habits. A few persons are able, within a period of days, to control their habits completely. At the other extreme are the patients who make no progress in habit control and even report an intensification of the habits because of an increased concern about them. In the majority of cases, however, most of the daytime habits will be controlled within a period of from eight to twelve weeks.

Conscious Control.—A patient can exercise control only after his habits have been brought to his level of consciousness

(converting the subsconscious habits into conscious habits). He is informed that when the local irritational conditions, such as overhanging fillings and excessive calculus, are removed, a major contributing cause of his habits will be eliminated. A régime of conscious control is then explained to the patient. In place of clamping and grinding habits, he must consciously substitute the physiologic rest position. This can be accomplished by audibly pronouncing a long word such as Constantinople or Guadalcanal. The use of a polysyllabic word causes the patient to bring into function most of the mouth musculature. On completion of such complex function, the normal muscle tone is assumed, and thereby the mandible is brought to physiologic rest position. At the moment of completion, the patient knows that he has achieved the correct position. He is instructed to maintain this position through conscious effort. Another simple method consists in telling the patient to "drop the jaw so that the teeth are slightly apart."

Nocturnal habits can also be controlled by conscious effort. Admittedly, such control is more difficult. The patient is advised to make an effort to fall asleep with his teeth slightly apart. He is requested to concentrate on the thought that he will continue to sleep with his teeth slightly apart. At this time, to avoid confusing the patient, no further methods are suggested.

Subsequent Visits.—Most periodontal cases necessitate a course of treatment involving more than a few visits. The practitioner will have sufficient opportunity during these visits to guide the patient in his régime of conscious control. The practitioner questions the patient from time to time concerning his progress. All patients who report improvement, i.e., diminution of the habit, are told to continue with the same type of control that has been effective thus far. If difficulty is encountered in control of diurnal habits, the patient must be further impressed with the importance of self discipline and conscious effort. As an additional aid, his family or friends may be requested to inform him when they note lip compression, muscle tension or any signs of the habit. The preceding methods usually suffice for most diurnal habits.

When nocturnal clamping or grinding persists, the practitioner should resort to progressively elaborate methods of control. The rationale consists of enabling the patient to sleep with the mouth approximating the physiologic rest position. A method of relaxation before retiring is first proposed. The patient is asked to follow a routine that will relieve the daily strain. A glass of warm milk, a hot bath or a pleasant, calming book is suggested. If such means are inadequate, a sedative may be prescribed.

The sleeping position influences jaw position and hence influences clamping and grinding. Patients who persistently sleep on the side, curled up with the chin on the chest, will have great difficulty in controlling nocturnal habits. An alteration of the sleeping position is used therapeutically. The patient is told to sleep on his back without a pillow. This procedure will break the habit in many cases because the anterior muscles of the neck below the mandible will be stretched, so that clamping and grinding are difficult. If clamping or grinding continues while he is sleeping on his back, the patient is advised to place a small pillow under the nape of the neck. However, since few persons will sleep in this position, this cannot be relied upon as the sole method. Many persons will not attempt this position through fear of insomnia, and most people will not be able to maintain the position after falling asleep. Sinus conditions attended by a postnasal drip also interfere with such a sleeping position.

A more strenuous method is the following: Some one sleeping with the

patient can interrupt his nightly grinding or clamping by separating his jaws or actually awakening him. If all the preceding methods are insufficient, an alarm clock routine may be attempted. Through the judicious use of an alarm clock, we have successfully controlled many resistant cases. The alarm clock is set for three hours after retirement. The patient goes to sleep, concentrating on keeping his teeth slightly apart. When the alarm rings, he awakens to check on the position of his teeth. If they are in contact, he resets his alarm for three hours later, repositions his head, stretching the anterior neck muscles, and concentrates again on keeping the jaws slightly apart, and goes to sleep. After a few nights, the habit may be controlled or appreciably decreased. This method is, of course, only suitable in selected cases, which excludes the insomnia patient and, in any case, should not be attempted for more than a few consecutive nights.

IMMOBILIZING SPLINTS

The use of a one-piece interdental splint to immobilize the jaws should be considered a radical procedure, to be used as a last resort. Splints are unclean, unpleasant to wear and often psychologically objectionable. When a splint must be used, it should be composed of acrylic material, preferably transparent, and should cover all teeth except the third molars. The splint is retained on the teeth by slightly passing the convex area of the teeth and is constructed for the patient's physiologic rest position. Flexible rubber splints are impractical since the patient grinds too easily within them. They merely lessen the impact of clamping or grinding, but do little to end the habit. When nocturnal habits have not been controlled by other means, the patient is told that he must wear a nocturnal splint. Such a warning often stimulates the patient to exert conscious control to a point where the splint becomes unnecessary.

For the first few nights, wearing a splint will be the most troublesome, frequently preventing sleep. A hypnotic, as pentobarbital sodium, may be advised for three or four nights. The patient wears the splint every night for three or four weeks. After this period, he sleeps without the splint for two or three nights. If the habit then reappears, he resumes wearing the splint for another two or three weeks. Rarely, a few patients develop new habits with the splint. In such cases, the splint must be laid aside for a few weeks. A splint is to be regarded as a temporary appliance, rarely to be worn longer than a two-month period.

PRACTITIONER-PATIENT RELATIONSHIP

It is imperative that the practitioner create a relationship between himself and his patient whereby he is able to evoke a strong desire in the patient to control the clamping or grinding habit. A sustained determination to overcome the habits throughout the intervals between visits depends greatly on this relationship. The practitioner must inspire the patient with confidence in order to learn from him not only his successes, but also his failures in control. This confidence stems in great part from the patient's inherent ability to accept ideas properly presented to him.

DIFFICULT TYPES

The practitioner should realize that some patients are not suggestible, and only through prolonged and painstaking effort will he succeed in establishing successful control in such cases. These patients fall into three general types:

1. The indifferent patient, who feels that he has done his duty by coming to the practitioner and it is now up to the practitioner to cure his condition. He will make no effort to cooperate.

2. The resistant patient, who is very positive that he has no habits. Further,

he is certain that he could have no habits without being conscious of them, hence he makes no attempt to observe himself.

3. The hypersensitive neurotic, who has a high incidence of habits, the neurosis frequently being the cause. In the more extreme and unmanageable of these cases, a consultation with a psychiatrist is advisable. Self-observation of habits by such patients will often be easier than with the ordinary patient, but the control may be more difficult. The most difficult patient will be the hypersensitive neurotic who suffers from insomnia.

RECURRENCES

Once controlled, clamping and grinding habits occasionally recur. This should not deter the practitioner. A patient who has successfully controlled his habits is very likely to recognize any relapse. Most patients will attempt to reestablish conscious control immediately. If they fail, they are apt to consult the practitioner before much harm is done.

SUMMARY

1. The normally functioning periodontal membrane is subject to intermittent stresses conducive to its health.

2. In clamping and grinding habits, the periodontal membrane is subject to constant or excessive stresses, which usually become primary or secondary etiologic factors in periodontal disease.

3. Clamping and grinding habits are perversions of occlusal function occurring more frequently than is generally acknowledged.

4. The habits, though complex, can be classified. Classification is an aid in detection and diagnosis.

5. The practitioner diagnoses the habits by obtaining a careful history of the patient's oral activity, including the patient's report of his mouth movements after a week of careful observation.

6. The control of clamping and grinding is established by:

(a) Removing local irritational conditions and eliminating hyperocclusal stress.

(b) Bringing subconscious habits into the conscious mind.

(c) Checking on the patient's identification of emotional or psychologic association with the habits.

(d) Substituting of physiologic rest position for clamping or grinding in the daytime through conscious control.

(e) Nighttime control through conscious effort, relaxation, change in sleeping position, alarm clock method and use of an immobilizing splint.

The diagnosis and control of habits should be an integral part of the practitioner's armamentarium in treating periodontal cases.

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INJURIES TO THE TEETH: CONTUSIONS AND FRACTURES RESULTING FROM CONCUSSION

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THE marked progress made during the past quarter of a century in the treatment of injuries to the jaws is largely due to experience gained with casualties in the first World War and with victims of automobile accidents. Knowledge concerning the treatment of violent injuries to the teeth, however, does not appear to have advanced commensurately during this period. Oral surgeons have been more interested in the major traumatic conditions of the jaws than in similar injuries to the teeth, while general practitioners of dentistry have improved the treatment of fractured tooth crowns far more than that of teeth in which the roots or pulps have sustained violent injury. As a result, the dental literature lacks adequate descriptions of methods for treating traumatized roots or pulps based upon clinical experience. The dentist who finds himself confronted with fractured roots or damaged pulps is left largely to his own ingenuity in dealing with them. A definite rationale of treatment is suggested by an analysis of the material presented in this report, despite the small number of cases.

Case reports of old fractures in roots of otherwise functioning normal teeth began to appear in the literature after the x-rays came into common use in dental practice, but these cases are mostly in the nature of curiosities. Ottolengui (1926) and (1927) published the histories and x-ray findings of a number of cases with root fracture. A report of a large series of such cases was published by Austin (1930), who reviewed x-ray records of patients at the Mayo Clinic and found retained fractured roots of anterior teeth in forty teeth. Thirty-one of these teeth responded to vitality tests. Only one patient complained of pain in a tooth with an old fracture.

Römer (1928) reported the occurrence of calcific union in a case of fracture of an unerupted immature tooth. Williger (1911), Gottlieb (1922), Howe (1926), Boulger (1928), Aisenberg (1932) and Kronfeld (1936) have presented histologic evidence of healing of root fractures in functionally mature teeth. All but one of these cases showed healing by permanent fibrous union. The teeth described by Howe showed union by calcification. All of the cases cited above apparently were discovered more or less accidentally during x-ray examination, extraction or necropsy. Therefore, the history begins with the finding of the fracture, years after the accident, and, consequently, little or nothing in the way of a clinical record is available, other than x-ray findings.

In a statement on the treatment of root fractures, Kronfeld (1933), in discussing other skeletal fractures, makes the following statement and suggests that it be applied to the problem of root fractures:

> From a clinical viewpoint . . . solid bony healing is obviously the most desirable outcome for every fracture. Four conditions are essential for such a solid bony juncture of a fracture. They are: (1) the fragments must be in a position of close adaptation, (2) the fragments must be immobilized in

this position, (3) infection must be absent and (4) the patient's general health must be such as to make reparative and regenerative processes possible.

Brauer (1936) and Grossman (1942) have reported good results of splinting of teeth with fractured roots. A number of other writers have recommended immobilization of traumatized teeth. Celsus, in the first century A. D., wrote, "If teeth become loosened by a blow, or any other accident, they are to be tied by gold wires to firmly fixed teeth."

The problem of treatment of coronal fractures with or without pulp-chamber involvement apparently has attracted the interest of more dentists than has treatment of root fractures. However, here too the case histories, including follow-up observations, are wanting. McBride (1933) circularized prominent members of the dental profession in an attempt to determine the consensus of opinion on treatment of traumatized teeth. More recent articles dealing with the management of coronal fractures are by Ellis (1940), Ireland (1942), Sweet (1942) and Zander (1942).

Partsch (1932), Kronfeld (1933), Thoma (1942) and others have published classifications of traumatized teeth. For the purposes of this presentation, traumatized, but otherwise functionally normal permanent incisor teeth are classified and defined as follows: (1) teeth with crown fractures not involving the dental pulp, (2) teeth with simple root fractures and (3) traumatized teeth without fracture. In the healing of these teeth, we are concerned chiefly with the dentin, cementum and the immediately adjacent soft tissues. This classification takes into consideration the fact that the pulp conveys viability to the dentin and that the cementum is nourished through the pericementum.

The records available for this report include a history, physical findings, diagnosis, treatment and follow-up observations on twenty-five teeth in twenty-one patients who had sustained injury to these structures during play or athletic exercise. Twenty-five permanent maxillary incisor teeth (eighteen central and seven lateral) are included in the series. The patients, three female and eighteen male, range in age from 9 to 19 years. Eleven teeth in eight patients fall under the heading of crown fractures, seven teeth in seven patients under root fractures and seven teeth in six patients under traumatized teeth without fracture. The history and physical findings of these cases were recorded on the same day as the accident, or on the day following.

In the diagnosis of fractures of the teeth, reliance was placed on direct inspection for coronal fractures and usually on the x-ray evidence for root fractures. The latter may not be discernible in all instances. Without the x-ray, it is often difficult to determine whether one is dealing with a root fracture or a partial displacement of a traumatized unfractured tooth. Both may show excessive reaction to thermal changes unless the injury is severe enough to block or sever the nerve connection completely, and both may show slight displacement or extrusion with abnormal mobility and hemorrhage in the crevicular space. After several hours, the displaced tooth becomes extremely tender to occlusal trauma or percussion. Again, both conditions, in the early state, may show an abnormal pinkness of the crown in the cervical region, indicating hemorrhage in the pulp chamber or into the dentin. Later, the well-known discoloration of the dentin appears.

In order to determine the condition of the pulp of an injured tooth, the following observations were made:

1. History of the injury.
2. Symptoms.

(a) Response to chemicals (foods).

(b) Response to thermal changes (hot gutta-percha and ice).

(c) Response to electric current (pulp tester).

(d) Response to mechanical irritation (scratching, pressure or percussion).

3. Signs.

(a) Changes in color of crown.

(b) Changes in transillumination.

(c) Changes in radiolucency or radiopacity of pulp or periapical region.

(d) Direct inspection of exposed pulp.

As many of these observations were made as were necessary for a satisfactory diagnosis. In all instances, corresponding teeth with normal pulp responses were available for comparison with the injured ones.

All injured teeth were treated similarly. When displaced, they were replaced as nearly as possible with firm finger pressure. After this operation, there usually remained some displacement as evidenced by slight extrusion of the coronal fragment and a clearly discernible fracture line in the x-ray film. When excessive mobility was present, the tooth was ligated to a wire splint constructed of half-round bar metal attached to approximating teeth on each side. The stability of this bar was sometimes improved by adjusting it to fit against the labial surfaces of several approximating teeth and ligating it in place. In some instances, the bar was soldered at one end to a band which was cemented to one of these teeth. When it was necessary to relieve the tooth of occlusal stress, the incisal edges or those of opposing teeth were ground down. The patients also were instructed to favor the injured tooth as much as possible and to avoid testing its mobility themselves. In all cases, the treatment was started the day of or the day following the accident. From the time of the accident, these teeth were inspected and pulp tests were made three times the first week, once a week for a five-week period and again after three, six and twelve months. The splints were removed after from six weeks to six months, the length of time depending on the severity of the condition. The results of the treatment are shown in the accompanying table.

When the coronal fracture does not involve the pulp chamber, the problem is largely to protect the pulp from undue irritation through the remaining thin layer of dentin, to secure retention for the restoration and to obtain a satisfactory cosmetic result. If the pulp chamber is involved, the difficulty of retention is removed, but there is added the more perplexing problem of the pulpless tooth. Methods of artificial restoration of lost crown structures, however, are not included in this paper.

To the healing of fractured tooth roots, the dental literature bears ample testimony. This has been described as fibrous union. A case of dilaceration or fracture of a developing tooth was described by Kronfeld (1933). Two such cases have come to my attention. Although evidence of calcified union of the displaced coronal portion with the rest of the tooth is present, it is difficult to determine what condition was present immediately after the injury. The case presented by Howe (1926) seems to be exceptional in this regard. Healing by fibrous union is the usual result, and apparently this allows for normal functioning of a tooth for all practical purposes. It seems reasonable as Thoma (1941) has pointed out that a root fractured within the alveolus has a better chance of recovery than one fractured outside the alveolus. A tooth with a root too short to reach into the bone socket naturally would stand a poor chance against another blow, and the human being has a way of repeating his errors. All the root fractures in this group were within the alveolus.

Of the twenty-five maxillary incisors included in this report, eleven had fractures of the crowns not involving the pulp chambers, seven had cross-sectional

fractures of the roots and seven survived the injury without fracture. Of the eleven teeth with coronal fractures, the one in which pulp destruction occurred was in a 9-year-old girl. The tooth was partially avulsed at the time of the accident, and apparently the injury in this case was too severe for recovery. The ten remaining teeth in this group of eleven all retained vital pulps.

The significant finding in these cases is the fact that all seven of those with root fractures showed vital pulps and these teeth were functionally normal a year later. In comparing these injuries with the results of concussion sustained by the peridental tissues of the unfractured teeth, the very occurrence of fracture appears to have lessened the injury to the pulps, partly by absorbing the shock of the blow and partly by providing a decompression and collateral circulation essential for the healing of the injured pulp. Two of these fractured roots presented x-ray evidence of post-traumatic changes, the one, evidence of calcification of the pulp chamber, apparently similar to that described by Kronfeld (1936), the other a breaking down of a comminuted portion of the root and substitution of a substance which appeared in the x-ray film as cancellous bone.

The four most striking cases in the entire group involved the teeth of patients F, L, M and P, each of whom had two approximating incisor teeth damaged in an accident. As far as could be determined, in each case the two injured teeth received the same blow and similar treatment.

F, a boy, aged 18, whose two maxillary central incisor teeth received a blow during a basketball game, received a crown fracture of the left incisor with loss of the mesial angle and a near exposure of the pulp. The right incisor sustained a cross-sectional fracture at the middle of the root showing hemorrhage into the gingival crevice, extrusive displacement of the coronal fragment, abnormal mobility and tenderness on manipulation. Both these teeth were vital one year later.

L, a boy, aged 14, received a blow during a football game displacing the left first and second maxillary incisor teeth palatally several millimeters at the incisal edges. An x-ray picture of the lateral incisor showed a cross-sectional fracture at the middle of the root and the central incisor unbroken. A year later, the lateral incisor was vital, but showed the pulp chamber and canal changes in the x-ray film referred to in the preceding paragraph. The central incisor showed dark discoloration and loss of translucency, and thermal tests were negative.

M, a youth aged 19, received a blow during a football game displacing the right

VITALITY TESTS OF TRAUMATIZED TEETH AFTER ONE YEAR

Crown Fracture				Root Fracture				Tooth Unfractured			
Patient	Age	Tooth	Vitality Test	Patient	Age	Tooth	Vitality Test	Patient	Age	Tooth	Vitality Test
A	19	1/1	Positive	I	8	/2	Positive	N	8	/1	Positive
B	9	1/	Negative	J	11	/1	Positive	E	11	/1	Negative
C	10	1/1	Positive	E	11	/2	Positive	L	14	/1	Negative
D	10	1/1	Positive	K	13	/1	Positive	O	17	1/	Positive
E	12	2/	Positive	L	14	/2	Positive	M	19	2/	Negative
F	18	/1	Positive	F	18	1/	Positive	P	19	21/	Negative
G	18	1/	Positive	M	19	1/	Positive				
H	19	/2	Positive								
8	9–19	11	10 Pos. 1 Neg.	7	8–19	7	7 Pos.	6	8–19	7	2 Pos. 5 Neg.

maxillary incisors palatally 1 cm. at the incisal edges. The central incisor root was fractured near the middle; the lateral remained intact. The coronal fragment of the central and the whole lateral incisor remained attached to a fractured portion of the alveolar bone and overlying soft tissues, which were also palatally displaced. I was present at the time of the accident and had the opportunity to effect a reduction of the displaced teeth immediately after the accident. Two hours later, a splint was in place and the occlusion was relieved by grinding the incisal edges. When these teeth were inspected a year later, the central maxillary incisor showed normal coloring, normal translucency and a positive, but delayed thermal reaction as compared with the corresponding central incisor. In the unbroken lateral incisor, pulp destruction followed the accident, and there was x-ray evidence of periapical tissue changes after three months.

P, a youth aged 19, was injured during a football game, the right maxillary central and lateral incisor teeth being partly avulsed and displaced palatally about 5 mm. at the incisal edges. Treatment, which consisted in reduction of the displaced teeth, immobilization and grinding of the incisal edges to relieve the occlusion, was started two hours after the accident. Both of these teeth became discolored and lost their normal translucency. Thermal tests were negative when openings were made into the pulp chambers for root-canal treatment three months after the accident.

One of the two teeth in the unbroken group that remained vital was in a boy 8 years of age who did not suffer a very severe injury. The other, also not a very severe injury, was in a youth 17 years of age.

In four other cases that are not included in this series of twenty-one patients, since they were not seen or recorded at the time of injury, a maxillary incisor had suffered a severe blow during athletic exercise in youth. Three of these showed the usual discoloration of the crowns of the otherwise intact teeth and also roentgenographic evidence of chronic periapical disease. Since this particular phenomenon is so thoroughly familiar to every dental practitioner, it is probably unnecessary to enumerate more of these cases. A discolored, moderately translucent central maxillary incisor of one of these four cases, however, presented roentgenographic evidence of complete obliteration of the pulp-chamber and canal. The crown of the tooth was markedly opaque and showed a brownish tinge in contrast to the dark discoloration of one that has undergone pulp necrosis.

All teeth in the group that sustained fractured roots recovered sufficiently for normal function, with roentgenographic evidence of healing by fibrous union and a positive reaction to pulp tests. Only one of the group that sustained fractured crowns failed to show a similar recovery of the pulp. All the unbroken teeth except two showed negative responses to pulp tests.

It is reasonable to assume that the apical portion of the pulp of a tooth which has received a sufficiently severe blow will suffer laceration or contusion, or both. If root fracture also occurs, the same type of tissue damage may be present at this site of injury. The inflammatory changes resulting from the tissue damage interferes with the circulation of the pulp. But fracture of the root may provide immediate decompression and, later, collateral circulation, thereby favoring recovery and preservation of viability of the pulp. Furthermore, the occurrence of fracture itself may prevent complete transmission of the force of the blow to the tissues between the tooth and the alveolar bone, and thus lessen the damage to the periapical structures. The table shows that those whose pulps were injured at both sites fared better than those whose pulps suffered from injury to the periapical region only.

These results also indicate that the therapy employed in the case of fractured teeth was successful. Reduction of displacement, immobilization by fixa-

tion and rest or reduced function have long been recognized as sound procedures in the treatment of fractures of other parts of the skeleton. It seems reasonable that they should be followed in the treatment of fractured or displaced teeth as well.

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PENICILLIN IN DENTISTRY

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PENICILLIN, obtained by mycologic experimentation, is one of the mold chemotherapeutic drugs. As a therapeutic agent, it gives promise to supplant the sulfonamides. Examination of case histories reported reveals many indications for the use of penicillin in the practice of dentistry. It has been found to be of value in sulfonamide-resistant cases of acute and chronic osteomyelitis, chronic abscesses, gonorrhea, cellulitis and other serious infections.

HISTORY

Penicillin was discovered by Fleming in 1929.[1] Clutterbuck, Lovell, Raistrick, Chain, Abraham and other investigators[2, 3] reported the chemotherapeutic effect and the low toxicity of penicillin. It was found that it is most active against the pyogenic cocci, many of which are sulfonamide resistant. It is not so potent against the gram-negative bacilli. In 1941, Abraham *et al.*[4] isolated penicillin in concentrated form.

Not since the miracle of the sulfonamides has any drug been so eagerly hailed as a curative agent and proved of such great value. Hundreds of millions of units of penicillin are being produced each month in order to save the lives and restore activity to the wounded and invalided members of the armed services.

The problem of supply is difficult. Because of its present scarcity and great value, penicillin is allocated monthly by the War Production Board under Order M-338. Most of the penicillin now made by the new large scale plants under government supervision is employed by the armed forces. Some quantities are being allocated to the Office of Scientific Research and Development for clinical trial, and it is hoped that it may soon be available for use in civilian medical and dental practice.

Crude penicillin has been made by physicians in their laboratories. A culture of penicillin is obtained from a hospital laboratory or the mold is grown and plates of culture media are inoculated with it. This crude penicillin has been used effectively by physicians in treating cuts, bruises, infections and other lesions. The dry form of the mold can be used for topical application.

PROPERTIES

Free penicillin is soluble in water, alcohol and acetone. The salts of penicillin vary in solubility and stability. Acid reactions destroy this drug, but it is comparatively stable in the form of neutral salts. Acetylation or benzoylation of the ammonia salt in solution increases the stability. Fine needles of the free acids are formed which have almost the same *in vitro* activity as the original material. An enzyme extracted from *Escherichia coli* destroys it without oxygen uptake.[5] There is nothing to indicate the relation between the presence or absence of an enzyme capable of destroying the penicillin in organisms and the susceptibility of such organisms to penicillin. Oxidation on evaporation at 40-45° C. inactivates penicillin. It is labile, but resists heating to 60 to 90° for brief periods and 100° for five minutes.

COMPOSITION

The exact formula of penicillin is not known. Experiments with the molecular

weight have determined an approximate formula: $C_{14}H_{19}NO_6$ or $C_{14}H_{17}NO_5H_2O$.[6] Penicillin is strongly dextrorotatory with an absorption maximum of 2750 A°.

PRODUCTION

The source of penicillin is the mold *Penicillium notatum*. The growth and isolation of penicillin are more difficult than those of other bactericidal substances because of the instability of the mold, and also the protean character of the penicillin and the yellow pigments of similar chemical nature formed in the mold.

In the normal metabolism of the mold, only very small amounts of penicillin are formed after several days. A great deal of research on this drug has been concerned with obtaining the most productive strains of the mold, the best culture media, methods for its purification, its stabilization and determination of its chemical composition. None of these problems has been satisfactorily solved to date.

In the dry state, penicillin will be stable for from three to six months when maintained at 5° to 10° C. At room temperature, it loses one-third to one-half of its potency. A clear solution can be made from the concentrate in pyrogen-free distilled water or an isotonic saline solution.

POTENCY

The final product, when marketed, will probably contain 100,000 Oxford units in each ampule. An Oxford unit[7] is defined as the smallest amount of penicillin which, when dissolved in 50 ml. of meat extract broth, inhibits completely the growth of the test strain of *Staphylococcus aureus*. The Florey unit is similar and is also used as a standard. The use of Oxford and Florey units will continue until a chemically pure natural or synthetic product is produced, at which time the milligram will be employed as the standard unit.

ADMINISTRATION

Dentists will be particularly interested in the local use of penicillin, but it should be noted that, as in the case of sulfa drugs when local application does not secure the desired results, systemic application should also be employed.[8] In the latter case, cooperation with the patient's physician is indicated. Many dental disorders with systemic involvement such as cellulitis, osteomyelitis and advanced periodontal disease, especially suppurative cases, will undoubtedly require intravenous, intramuscular or oral administration as an adjunct to topical use.

The dosage varies according to the disease.[9] The blood level of penicillin is usually maintained by the intravenous route with 30,000 to 40,000 units in 2 liters of saline or dextrose solution, injected rapidly at first (100 to 200 cc.) and then at 30 drops per minute. The rate of injection is immaterial if the blood level is maintained. Great variation in dosage has been reported. Usually, in staphylococcal (acute and chronic) infections 100,000 units is required daily, streptococcal, pneumococcal and meningococcal infections requiring lesser amounts. Bovine actinomycosis requires small amounts given over long periods. It is interesting to note that penicillin, when given by mouth with sodium bicarbonate, is excreted in the urine, the bile and the saliva.

The intelligent administration locally of penicillin depends on a bacteriologic study of the infected area and the maintenance of the bacteriostatic concentration of the drug in the affected areas.

The essence of the problem of using penicillin locally is some means of applying this very soluble and diffusible substance so that a bacteriostatic concentration is constantly maintained at every point where there are infecting organisms. The whole infected area must be reached in order for penicillin to be effective. Surgical procedures, as an ad-

junct to penicillin therapy, may have to be unorthodox. Free drainage of a wound is undesirable, since the drug drains away with the exudate. It is reasonable to assume that dental granulomas, sinus infection and infections in closed cavities may be treated by injection of penicillin directly into the diseased areas. Florey says[10]:

> It is best to establish a closed cavity, when possible, into which penicillin can be instilled, and from which exudate can be sucked away periodically if necessary. In mastoid surgery, this was accomplished by sewing up the wound from below, inserting a fine rubber tube into the upper part of the wound down to the base of the cavity and suturing it in place. After sufficient penicillin is injected to fill the cavity, the tube is closed by a spigot. The suture line was smeared with a vaseline-penicillin mixture. In this type of wound, aspiration of exudate and injection of penicillin every twelve hours is probably sufficient.

Penicillin combines to an extraordinary degree the two most desirable properties of a therapeutic agent: (1) low toxicity to host cells and (2) powerful bacteriostatic action. This drug has a selective action against staphylococci, which predominate in dental infections, besides which it has a bacteriostatic action against streptococci.

Local treatment with penicillin has proved successful in mastoiditis, blepharitis, chronic conjunctivitis and chronic wound sinuses.[11, 12] With this clinical evidence and the knowledge that penicillin will destroy staphylococci, streptococci and pneumococci when applied locally, it is reasonable to assume that such dental disorders as periodontoclasia, osteomyelitis, Vincent's infection, apical granuloma and dry socket infections will be successfully treated with this drug.

A list of bacteria susceptible to this drug includes the following: *Streptococcus haemolyticus, Streptococcus viridans, Vibrio septicus* and the lactobacillus and staphylococcus. This list of susceptible bacteria indicates the value which penicillin will have in the treatment of the dental disorders listed above, and it may also prove of value in the prevention of dental caries. Penicillin is outstanding in achieving results in almost 1,000 reported cases of *Staphylococcus aureus* infections, with and without bacteremia, in the United States and abroad. Unlike the sulfonamides, penicillin will act in the presence of hydrolytic protean break-down products, serum, blood, peptones and tissue autolysis substances or pus. The local effect of penicillin on mucous membranes is non-irritating. It penetrates tissue and it is not toxic.

There are several salient features of penicillin therapy which make it particularly applicable to dental use: (1) its potency against sulfonamide-resistant bacteria, especially the staphylococcus, (2) its activity in the presence of serum and pus, (3) its successful application in treating closed cavities and sinuses and other reported cases analogous to those found in dental disease, (4) its action on lactobacilli and (5) its ability to act when applied topically.

All these features indicate that penicillin will have a prominent place in the drug armamentarium of the dentist.

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A STUDY OF CASES NOT AMENABLE TO PERIODONTAL TREATMENT

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FOR many years, articles on periodontia have related experiences in the successful treatment of periodontal disease. It is equally important to know which cases will not respond to therapy, for this knowledge can reduce the number of failures in the practice of periodontia. Failures, like successes, should be carefully recorded for future guidance.

The purpose of this paper is to indicate cases that are not amenable to treatment and to emphasize the conditions upon which such opinion is based.

Most failures of treatment occur in the initial stage—diagnosis—at which point, etiology and prognosis are closely linked. Diagnosis requires a keen eye, a good memory and a profound knowledge of the fundamental sciences. It is at this stage of treatment that we must recognize the lesion and determine its etiology and decide as to the advisability of treatment.

It is an acknowledged fact that periodontal disease can be cured. The definition of cure should be clearly understood.

By the cure of periodontal disease is meant the following: (1) the teeth become firm and useful members of the dental apparatus; (2) suppuration and bleeding cease; (3) pockets are eliminated; (4) the gingivae become firm, resistant to infection and of a normal healthy color, and (5), in some cases, it may be observed roentgenographically that filling-in of bone occurs, whereas, in others, an increase in bone density is established. However, filling-in of bone does not occur in every case and need not be considered necessary for a cure. There may be no return to an ideal condition, but the progress of the disease has been checked and what remains of the periodontium continues to be healthy. . . . There are cases, of course, which have progressed too far for successful treatment (Figs. 1 and 2). Despite all efforts, they will not respond to therapy. In other cases, the etiology is obscure and the progress of the disease so rapid that treatment is instituted only as a temporary relief measure (Fig. 17). However, if the etiologic factors can be controlled successfully and the prognosis is favorable, the patient can be given a reasonable assurance of the success of the treatment. With some exceptions, the usual procedure is to eliminate all local and systemic etiology, remove all supragingival and subgingival calculus by the use of prophylactic instruments, surgical methods or electrocoagulation, teach the patient gingival massage and instruct him in what consti-

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tutes a well-balanced, vitamin-containing diet.[1]

Many conditions will determine whether an entire mouth or a particular tooth will respond to treatment. Through trial and error, plus a knowledge of fundamental factors, we have learned to recognize what circumstances will render prognosis favorable or unfavorable. Most often, it is a combination of factors which will determine whether treatment is justifiable. To illustrate: In a

Fig. 1.—Photograph of mouth.

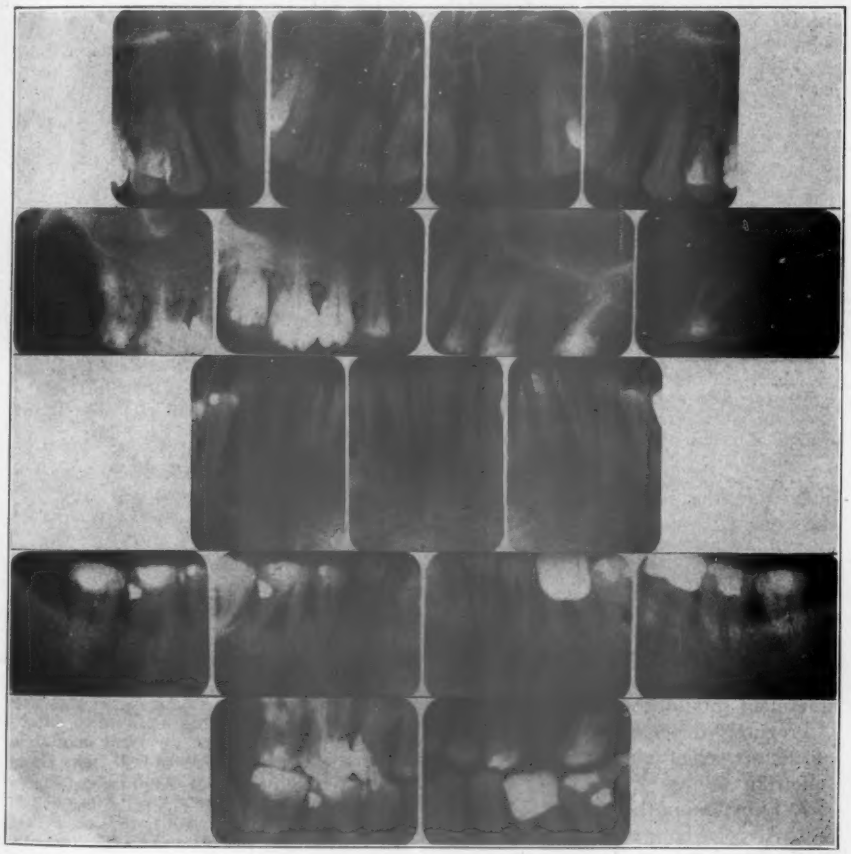


Fig. 2.—Roentgenograms of case shown in Figure 1. In spite of the fine appearance of the teeth and gingivae, there is severe loss of bone in both jaws. There is involvement of all the trifurcations and bifurcations of the upper and lower posterior teeth. The prognosis was unfavorable and extraction of all teeth was advised.

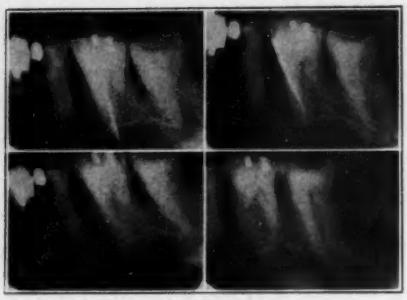


Fig. 3.—Roentgenograms demonstrating pocket with aid of gutta-percha point. The upper pictures do not show the presence of the pockets indicated by the gutta-percha points below.

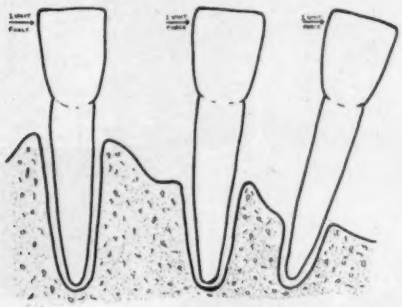


Fig. 4.—Diagrammatic representation of action of given force on tooth with different degrees of bone support.

given case, the pockets may be deep, yet the bone support is strong and the teeth are immobile. Such a condition may respond well to treatment. On the other hand, no pockets may be present, but the bone support may be inadequate and there may be marked tooth mobility. This tooth may be a very poor risk, and treatment should not be instituted.

Prognosis depends on a combination of factors, chief among which are the following:

1. Extension of the pocket.
2. Alveolar bone support.
   (a) Type of bone.
   (b) Amount of bone remaining.
   (c) Distribution of bone.
3. Mobility of teeth.

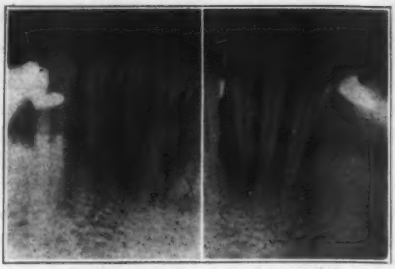


Fig. 5.—Roentgenograms showing severe bone loss around a lower central incisor. Very little force is needed to dislodge this tooth. The prognosis is hopeless.

Fig. 6.—Destruction of bone around mesial surface and apical regions of right lower central and left lower lateral incisors due to spread of bone loss from left lower central incisor.

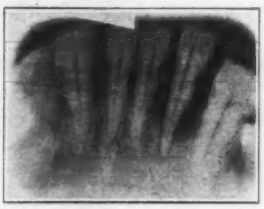


Fig. 7.—Roentgenogram showing uneven bone loss. Prognosis of the right central incisor is better than that of the right lateral because the center of rotation is higher. (Compare diagrams in Figures 6 and 7.)

4. Number of teeth remaining.
5. Age of patient.
6. State of health.

7. Possibility of removing etiologic factors.

8. Cooperation of the patient.

EXTENSION OF THE POCKET

Pockets can be observed in one of two ways: (1) by probing with a suitable instrument and outlining the depth on a record chart or (2) by placing a gutta-percha point in the pocket and then taking a roentgenogram of the area. (Fig. 3.)

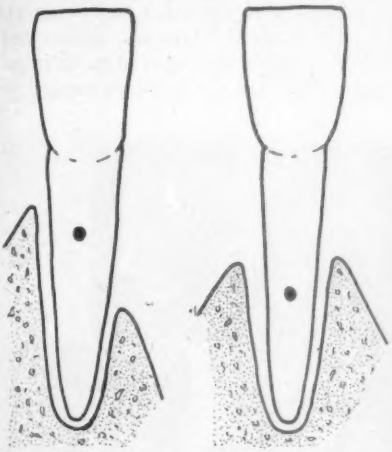
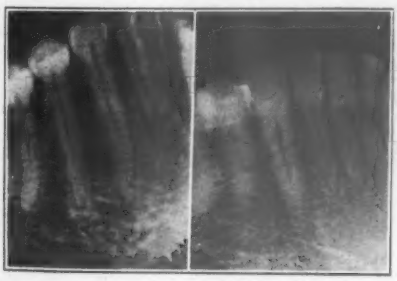


Fig. 8.—Diagrammatic representation of uneven distribution of same type of bone around tooth, showing relative position of center of rotation. The tooth in Figure 7, left, has a better prognosis because the center of rotation is nearer the incisor edge and the leverage on the tooth is less than in Figure 7, right.



A B

Fig. 9.—Roentgenograms showing (a) alveolar bone with large cancelli surrounding teeth that have more unfavorable prognosis than (b) teeth embedded in bone with smaller cancelli.

Pockets which extend into the bifurcation or trifurcation of an upper molar or the bifurcation of premolars and lower molars usually render the prognosis unfavorable. (Fig. 2.) Likewise, pockets which involve the apices of teeth makes prognosis unfavorable. (Fig. 6.)

Fig. 10.—Photographs of case in which all upper teeth were extracted. The position and location of the teeth that could be saved were such that they would not stand up with replacements.

Fig. 11.—Extreme overbite.

The exception to the rule of extracting teeth with the above-mentioned involvements may occur in a lower molar bifurcation where the roots are widely spread, well anchored in bone and not mobile. In some cases, when it is nec-

essary to save the tooth, gingivectomy may be performed to the base of the pocket, creating a cleanable area between the roots. The patient is instructed in oral hygiene and in the use of pipe cleaners or rubber stimulators between the roots. Even these teeth do not show the best results, for the least neglect sees the return of the original condition. Sometimes, in the case of upper molars, where there is an involvement of the bifurcation between the mesial and distal roots only, gingivectomy may be performed and copper cement be placed between the roots to prevent reinfection.

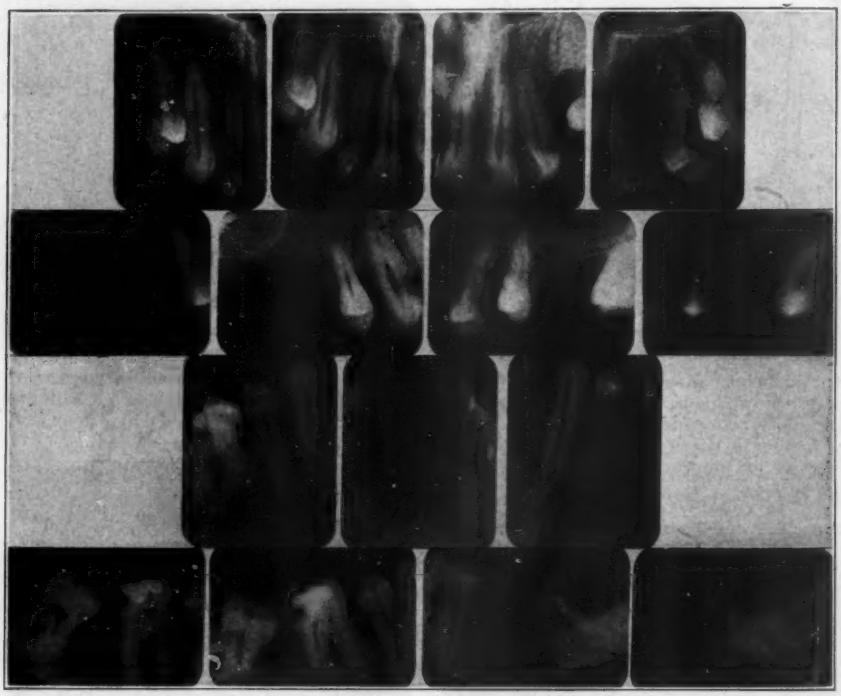


Fig. 12.—Roentgenograms of case in Figures 10 and 11.

ALVEOLAR BONE SUPPORT

There are three considerations in determining whether the bone support of a tooth is adequate: (1) the amount of bone remaining, (2) the distribution of the bone and (3) the nature of the bone.

In general, we might say that at least half the bone around a tooth root should be present if treatment is to be successful. Mechanically, one can understand that the longer the lever arm (clinical crown), the less the pressure needed to move the anchored portion (clinical root). (Figs. 4 and 5.)

In some cases, the interseptal bone is so affected that it disappears rapidly and the contiguous teeth become involved. In other cases, the root of a tooth may not be surrounded evenly by bone. The uneven distribution of bone may be of advantage since the center of

rotation is nearer the occlusal surface and the leverage is reduced. (Figs. 6, 7 and 8.)

The type of bone surrounding the tooth is of great importance. A dense bone, with small medullary spaces, will support the tooth better than will bone with larger cancelli. In using this diagnostic method, we must be aware of the fact that bone on the buccal, labial and lingual surfaces of teeth is not often discernible, even with the aid of roentgenograms. Judgment must be employed in evaluating the amount of bone support, after the nature of the bone has been determined. (Fig. 9.)

MOBILITY

The extent of mobility of a loose tooth should be determined. If a tooth can be moved a maximum of 1 mm., that is 0.5 mm. in each direction from its center, or if the tooth can be rotated or depressed in its socket, the prognosis is unfavorable. The exception may occur when mobility is due to excessive pressure which can easily be remedied or the tooth can be stabilized by splinting.

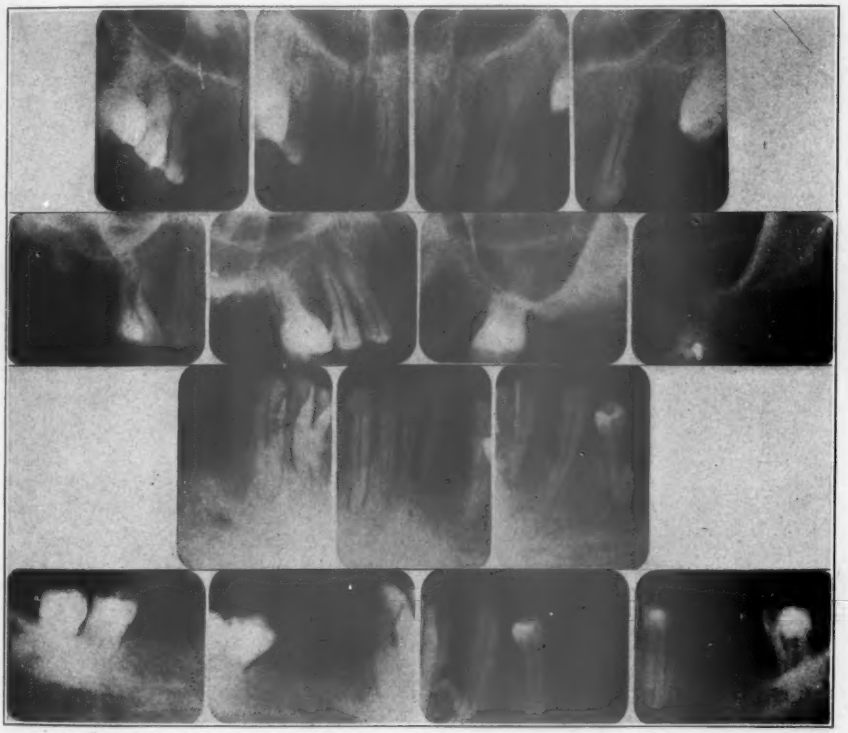


Fig. 13.—Roentgenograms showing distribution of teeth that would remain after extraction of teeth so indicated; upper right 4 and 7, upper left 7 and lower left 3 and 7. The remaining teeth are not strong enough or located strategically to withstand partial dentures. The prognosis is unfavorable.

NUMBER OF TEETH REMAINING

The ideal mouth is so formed that from twenty-eight to thirty-two teeth are present to take up and divide the

stress placed on the masticatory apparatus. Loss of any teeth therefore puts a strain on those that remain. Loss of contact also removes some of the support of teeth. The fewer the teeth remaining, the more unfavorable the prognosis. Not only do the structures of these teeth have to support their own load, but also they are forced to support the load of the replaced teeth. If there are a few teeth in good condition remaining in the mouth, well supported by dense bone and strategically located so that fixed bridges or partial dentures can be constructed, there is hope that they may be useful for some time provided the load is well distributed. Otherwise, extraction is advisable. (Figs. 10, 11, 12 and 13.)

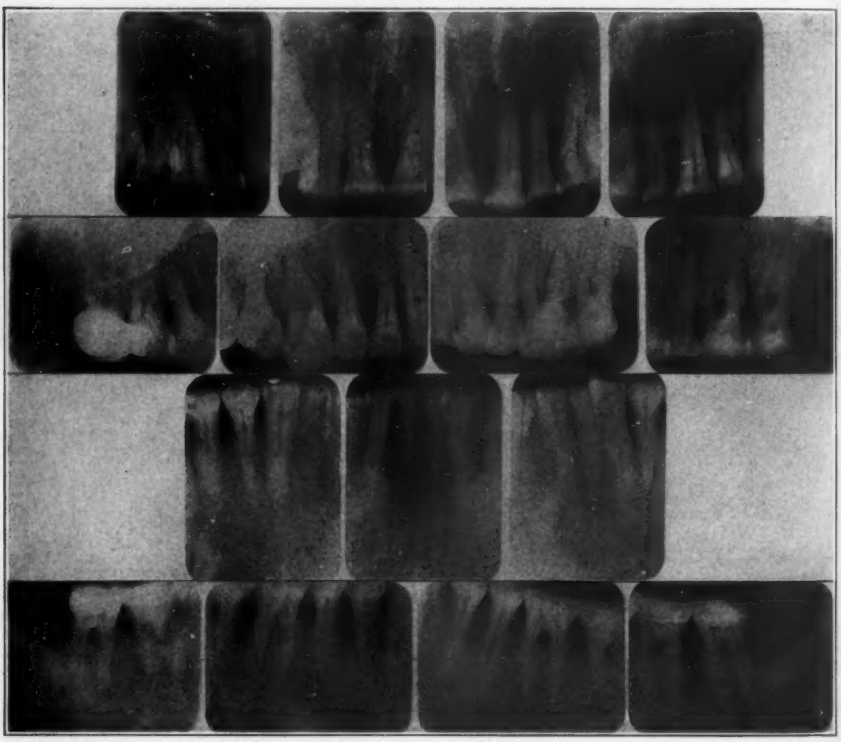


Fig. 14.—Roentgenograms of patient aged 50. The prognosis as to the posterior teeth is unfavorable owing to bifurcation involvement.

AGE OF THE PATIENT

As a rule, older patients with periodontal disease respond better to treatment than do younger patients. This fact is based upon the premise that, in older patients, the bone is already fully formed and has had the ability to resist the disease for a long time, while, in younger patients, that bone may never have had the opportunity to form properly or had not built up enough resistance to cope with the disease. In these younger patients, repair is induced with much more difficulty. (Figs. 14 and 15.)

STATE OF HEALTH OF PATIENT

If the health of the patient is such that long drawn out procedures are not to his best interest, the simplest methods are advised. In these cases, a definite prognosis should be decided upon before treatment is instituted. Where infections are traceable to oral foci, elimination of these foci is indicated. If there is any doubt in these suspected cases, the more radical procedure of extraction is advisable. The dentist should not hesitate to consult with the physician of the patient regarding his general health. (Figs. 16, 17, 18 and 19.)

POSSIBILITY OF REMOVING ETIOLOGIC FACTORS

In undertaking treatment of a case, one should be certain that the etiologic factors can be eliminated. Where removal of those factors is not certain, the prognosis is poor. These factors may have a local or systemic background.

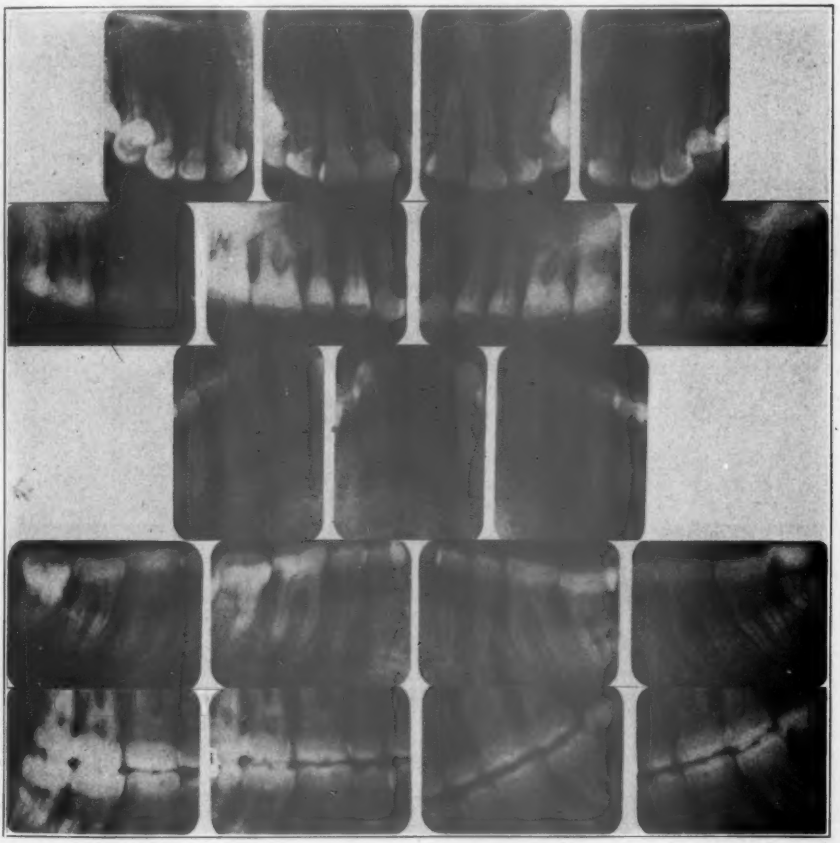


Fig. 15.—Roentgenograms of patient aged 25. There is severe bone loss throughout the mouth and the bone is of the type with large cancelli. The final prognosis for all the teeth in this mouth is hopeless.

Severe malocclusion and chronic systemic disease may be considered in this category. (Figs. 10, 11, 12, 15, 16, 17, 18, 19, 20, 21, 22 and 23.)

COOPERATION OF THE PATIENT

Before a case is accepted for treatment, the patient should be advised of the part that he himself is to play in the correction of the oral condition. Just as his physician might order medication or other therapeutic measures, so the dentist must stress home care by the patient and insist upon regular visits for check-up. Toothbrushing must be done regularly and properly; and other conditions that can be controlled by the patient must be explained (diet, exercise, correction of habits, etc.). When the patient fails in his part of the treatment plan, the final result must inevitably be failure. No case can be successfully completed without the patient's full cooperation. (Figs. 21, 22 and 23.)

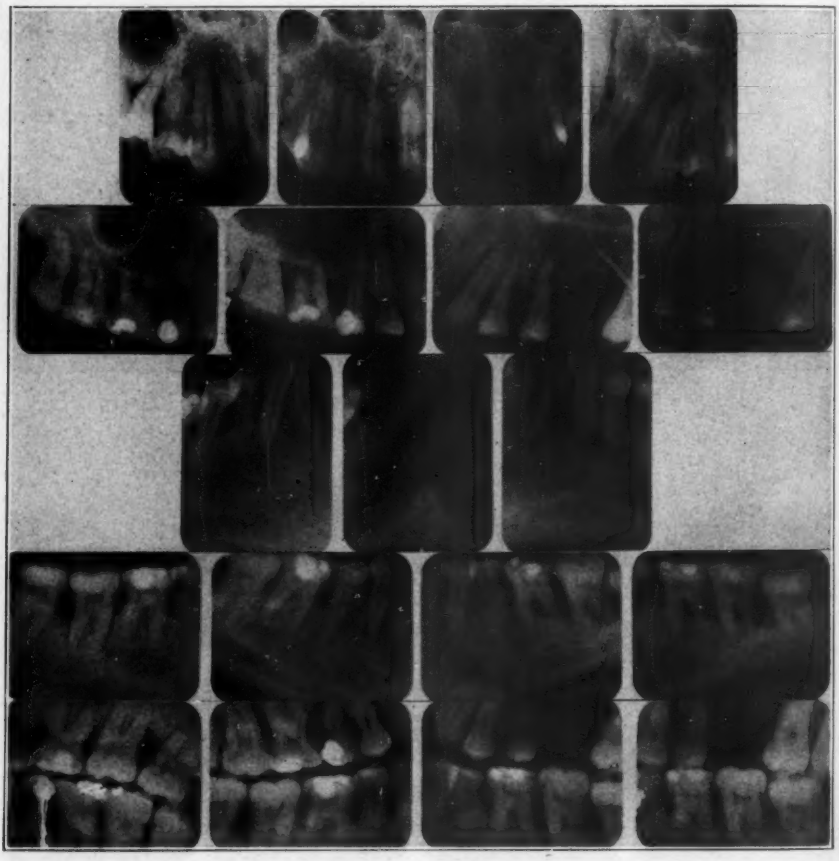


Fig. 16.—Case of woman aged 35. The systemic etiology was undetermined. The patient was neurotic. The prognosis as to all the teeth was hopeless.

In this paper, we have attempted to point out some of the pitfalls in the treatment of periodontal disease. The cases presented are those in which treatment was not undertaken because of a hopeless prognosis. It is better to refuse treatment than to undertake therapy and fail because of faulty diagnosis. Treatment of only those cases that are amenable to treatment will reduce the number of failures in the practice of periodontia.

Fig. 17.—Teeth of a boy aged 14. The systemic etiology was unknown. Prognosis as to all teeth was hopeless. (Courtesy of Charles Barrett, Hartford, Conn.)

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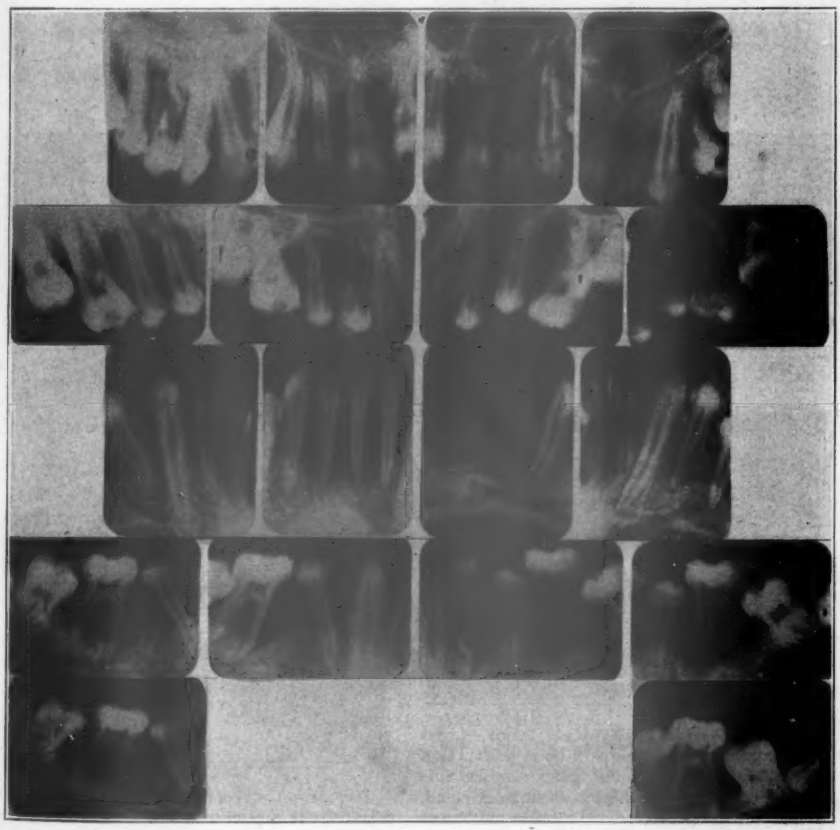

Fig. 18.—Roentgenograms of case in Figure 17.

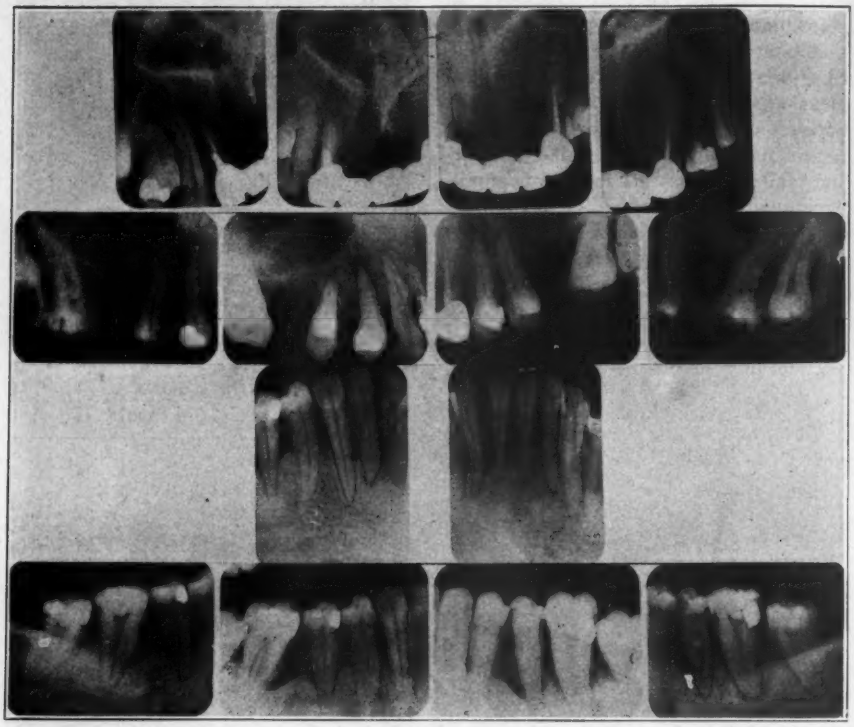

Fig. 19.—Case of man aged 25 with diabetes. Prognosis as to all the teeth was hopeless.

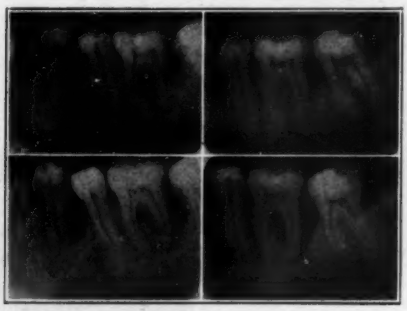

Fig. 20.—Roentgenograms taken seven years apart. The progressive bone destruction on the distal aspect of the first molar was due to occlusal trauma, which was not corrected. While the prognosis regarding the tooth was originally fair, it is now hopeless.

Fig. 21.—Case of *Schmutz* pyorrhea. Such a patient is a poor risk unless he can be impressed with the necessity of oral hygiene.

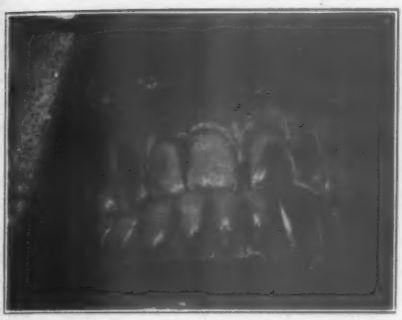

Fig. 22.—Case of toothbrush abrasion. Correct brushing is of great importance in the treatment of such a case.

Fig. 23.—Result of pipe-smoking habit. This habit and the occlusion must be corrected to insure good results.

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Fig. 24.—Result of pipe-smoking habit.

PSYCHOSOMATIC ASPECTS OF DENTISTRY

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"PSYCHOSOMATIC medicine" is a new term, but it describes an approach to medicine as old as the art of healing itself. Physicians have always known that the emotional life has something to do with illness, but the structural concepts of disease introduced by Virchow led to the separation of illness from the psyche of man and a consideration of disease as only a disorder of organs and cells. With this separation into many different ailments came the development of specialists to attend to all of these distinct diseases. With the specialists came the introduction of instruments of precision, and the mechanization of medicine began. Medicine now contented itself with the study of the organism as a physiologic mechanism, impressed by blood chemistry, electrocardiography and other methods of investigation, but unimpressed by, and indeed often holding

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in contempt, the psychologic background of the patient, which was not considered so scientific as the results of laboratory studies. This period may, in truth, be referred to as the machine age in medicine. It is not to be denied that remarkable developments have occurred during this period of laboratory ascendancy, but it also must be admitted that the emotional side of illness has been almost entirely neglected.

Of all branches of medicine, dentistry has perhaps been the one most separated from the psyche. The word "dental" has come to be associated with the idea of "mechanical"—fillings, extractions, dentures, appliances, devices, etc. It is the purpose of this paper to point out that we cannot divorce a man from his teeth. In other words, not everything dental is synonymous with "mechanical." The cliché "the very idea of going to the dentist stops the toothache" is an indication that psychosomatic influences enter into dental practice. Moreover, it suggests that there are still a great many people who are afraid to go to the dentist—they are afraid of being hurt.

Many people have great anxiety about physical pain and are very much ashamed of it, but they can do nothing about it. The idea of being stuck with a needle for a blood count or Wassermann test fills them with dread. After being hurt by a dentist's drill, they are loath to return for treatment.

Another reason for avoiding the dentist is that the loss of teeth may have a greater significance than just the association of pain or discomfort. Losing a tooth, according to an old adage, means "losing a friend," but it also means, in the unconscious thinking of many people, loss of strength and loss of virility. Of course, there is the conscious idea of the effect on the appearance, but quite aside from the idea of a possible alteration in the appearance is the idea that the wearing of dentures is a sign of old age. This is true not only of women, but also of many men. It is one of the reasons that many chronic illnesses of psychosomatic origin can be traced to a dental operation, the fitting of dentures and the failure of the patient to adjust himself to them.

DENTAL PROBLEMS OF CHILDHOOD

A partial answer to this problem is for the parent and the dentist to cooperate in persuading children to regard dental treatment as sensible and necessary, and as attended by a minimum of discomfort rather than as an ordeal. Many adults unthinkingly exaggerate the pain associated with a visit to the dentist, so that the child comes to fear the dentist's office as a modern torture chamber, and a visit to the dentist becomes a struggle in which the child emerges the victor.

Adults should avoid conveying to the child the idea that a visit to the dentist is going to be painful, and visits should be started before painful procedures have to be carried out. This gives the dentist and the child an opportunity to get acquainted and enables the child to find out that the visit can be fun. If parents do their part and the dentist does his, early in the life of the child, there will be less neglect of dental hygiene because of fear.

Once the child is in the dentist's office, he should not be babied by either mother or dentist. In fact, the more he is treated like an adult, the better he will behave. Unfortunately, the converse is also true—it is often necessary to treat adults like children in order to win their cooperation. Often, the child will sit in the chair and be content to be alone with the dentist, and the mother can remain in the waiting room. It is bad practice for the mother to hover around, asking whether her child is being hurt. Suggestion operates in subtle ways and if the parent and dentist assume the child will behave like an adult, he will often do so; whereas if they expect him to be afraid and to refuse to cooperate, he may also

readily do this. If a child refuses to cooperate, it is not wise to use force unless a real emergency exists, for the combination of force and pain will cause him to dread the next occasion all the more and be the means of establishing an attitude that means dental neglect in later life.

Thumbsucking.—The dentist, particularly the orthodontist, is concerned with thumbsucking. I suppose that there are many factors other than thumb or finger sucking in the problem of deformity. Be that as it may, the main controversy has been in regard to the question of mechanical restraint. It seems to me that once this behavior is understood, there is no further cause for alarm on the part of mother, physician or dentist. The infant derives pleasure and relieves tension by sucking. When the child is hungry, tense, lonely or tired, and no one feeds him, plays with him or otherwise pleasantly distracts him, he will comfort himself by sucking his thumb. Any child, even the well-adjusted, will occasionally resort to the practice, but it will not become persistent or excessive if the child is well fed, is weaned carefully and slowly and is played with enough. When encountered as a persistent habit, the following points should be kept in mind in advising the parent:

1. Do not forget that the activity of sucking is normal. In the first year to eighteen months of life, sucking is one of the chief sources of emotional satisfaction for the child.

2. If thumb sucking is excessive, do not interfere directly with the activity. Avoid scolding and pulling the thumb out the mouth, avoid mechanical restraints, avoid foul-tasting applications and, above all, avoid shame, criticism and ridicule.

3. Play with the child more often and use play materials suitable to his age. Encourage him to play with other children.

4. See that he has opportunity (space) to be active and to explore.

5. If the home atmosphere is not one of happiness, ease and friendliness, the adults should strive to make it so rather than to concern themselves only with the baby's problem. We must always remember that the child's psychology is largely determined by parent-child relationships and that a disturbance in the emotional life of the child can usually be attributed to the atmosphere of the home. If the parents have a disturbance in their emotional lives, it is almost certain to be evidenced in some defect in the personality of the child.

RELATION OF DENTISTRY TO EMOTIONAL ASPECTS OF SURGERY

Just as the dentist is feared, so does the opposite situation sometimes exist in the adult patient. He may be very amenable to the idea of losing his teeth. He may even derive a certain perverse satisfaction from having teeth extracted. These are the people that are addicted. to polysurgery.[1] As may be imagined, they are psychoneurotic. When they have some physical discomfort, having heard of illnesses being cured by the removal of "foci of infection," they become their own diagnosticians and often conclude that a tooth or several teeth should be removed. Like the patient who wants his tonsils or appendix removed, they usually manage to get the operation done. Following is the report[2] of such a case:

A very obese, middle-aged white woman had been obsessed for several years with the idea that she had cancer of the throat and, despite the reassurance of many physicians who had studied her carefully, she continued to believe "that there must be some physical basis for the pain and burning sensation in the back of the throat." She also had a great fear of infection, was meticulously clean about her home and was forever washing her hands. She was insistent about having something done for her throat, and she herself made topical applications of irritating solutions until, on many occasions, bleeding occurred. She then developed pain in the

side of the face and, although the x-rays showed nothing more than devitalized teeth —no evidence of apical infection—she finally succeeded in persuading a dentist to remove these perfectly good teeth. She encountered less difficulty in sacrificing her tonsils. Both operations gave temporary relief, but the symptoms returned and were worse than ever.

Her physical symptoms were so fixated that it was impossible to accomplish more than the most superficial investigation of her situation. The only digression that she would make from a discussion of her physical symptoms was to upbraid her local physician for fancied mistreatment and insulting behavior. He had sent her to me for a general diagnostic survey, but continued to supervise her care. She spent a great deal of time criticizing him for lack of interest in her condition and for the "contemptuous way" in which he treated her. Nevertheless, it was obvious that, underneath this surface hostility, there was a very positive attachment to her physician, which was indicated by her continuing under his care and by such statements as that she had great faith in his scientific ability; on occasions, he had been very kind to her, and her children and her husband were devoted to him.

She was a very religious person and went to church every morning, seeking help for her illness. On one occasion, when she felt that she had been more than ordinarily mistreated by her physician, she went to church to seek help in making a decision on two related questions: first whether finally to quit her physician and seek another and, second, whether, for financial reasons, it would be better to give up a health insurance policy which provided nursing service in case of a confining illness. She had carried this policy for a long time without realizing benefits and now her funds were low. On the particular morning in question, she prayed for help in making these two decisions. As she left church, she noted that it had been raining and while ordinarily, because of her overweight, she took special precaution in descending stairs, she was "not so careful" as she should have been and, on reaching the third of three steps, slipped on a wet spot, fell and fractured the left ankle. As she explained to me on the telephone the next day, she "got her answer" quicker than she thought she would. She seemed in a cheerful frame of mind as she told me, with evident satisfaction, that her physician had immediately responded to the call after this accident.

Although the purposefulness of the accident is the real reason for the case report, it also shows the perverse kind of a personality that often manages to get unnecessary surgical work done. It is hardly necessary to add that all of her old symptoms returned once the fracture had healed.

There are some powerful unconscious impulses at work in these people that cause them to be so persistently illogical. First, the idea of a "focus of infection" makes them feel that they harbor something "unclean." The idea that "toxins" (impurities) are being discharged from an unclean (infected) area and entering the blood stream causes them anxiety. Their whole attitude is one of "out with it" as soon as possible and they will not rest until the tooth, the appendix, or even the gallbladder is out. Often the patient is assisted in his desire by a dentist or a physician who is not certain of the advisability of the operation, but feels that "it will do no harm." That it will do harm has been demonstrated by numerous case reports of confirmed invalidism.[3]

Another unconscious motive in this sacrifice of organs is to help get rid of a sense of guilt. This sense of guilt usually dates back to childhood and resides in the unconscious mental life, so that such patients do not realize that they are trying to assuage guilt when they periodically suffer the pain and make the sacrifice of having something removed, be it from the mouth, abdomen or pelvis.

Psychologic Preparation for Surgical Operations.—It is necessary for the dental surgeon, just as it is for the general surgeon, to be on his guard with such people lest he play into their hands by performing useless operations. If it were just useless, it would not be so bad, but it adds to the misery of the patient and eventually results in criticism and

trouble for the surgeon. Both the general surgeon and the dental surgeon must learn that there is such a thing as psychologic preparation for operations, just as there is a physical preparation. Surgeons are always so careful to prepare their patients physically for operations. They would not think of performing a major operation without knowing that the cardiovascular-renal system had been surveyed, but they almost never give any consideration to the personality of the patient, how much anxiety is present and what the effects of a surgical experience may be as far as the personality is concerned. We recently had in the hospital ward an elderly woman who had a huge enlargement of the thyroid gland, which was removed because it was pressing upon the trachea. She had had discomfort, but not severe dyspnea. The anatomic problem loomed large in the clinical picture, but the patient was very apprehensive before the operation and after the operation became completely psychotic. As it turned out, we wonder whether perhaps she would not have been better off with the lump in her neck. Similar instances occur in dental surgery:

> An attractive, single woman of thirty years complained of fatigue, nervousness and constipation. She had had the same symptoms at 17 and her pyhsician had said that the illness was due to focal infection and ordered all of the upper teeth extracted. This was during the period when the theory of "focal infection" was so enthusiastically endorsed by the profession that the removal of teeth and tonsils proceeded at a prodigious rate. Every obscure illness was held to be due to focal infection. If we could pile together the teeth and tonsils that have been unnecessarily removed from patients with illnesses of emotional origin, we would have an imposing monument to an era of overcredulity in regard to a significant American contribution to medicine—the theory of focal infection. What sins we have committed in its name!
>
> The removal of the upper teeth in this young woman, despite the fact that a very satisfactory denture replaced them, was a circumstance that affected her whole life, coloring her reactions in all of her personal contacts. She became extremely sensitive about her mouth and thought that everybody was looking at it and making remarks about it. She developed marked feelings of inferiority. These feelings interfered with her position and with her marriage. It is impossible for me to conclude that it was unnecessary to remove her teeth, but from her description of them it seems probable that it was a radical and unwise procedure. Nor do I wish to contend that her sense of inferiority was entirely determined by this circumstance. Undoubtedly, she had some such feelings to begin with, but the surgical operation added to her problem and burdened her whole life.

Atypical Neuralgia.—Many pains about the head, face and neck are wrongly assumed to be due to dental pathosis. Teeth are extracted or sinuses operated upon, when a careful analysis of the pain would show that atypical neuralgia due to "focal conflict" rather than "focal infection" is present. A study of the life situation rather than a search for "foci of infection" is the proper approach.

For many reasons, it is advisable to proceed cautiously in the case of the patient who is eager to have a surgical operation, general or dental. The mouth is an area around which a great deal of interest and pleasure are centered during infancy and childhood. Likewise, it is an area around which fantasies of hostility are likely to occur. The child identifies himself with the animal who attacks and destroys with the mouth. He thinks of himself as doing likewise, and then has guilt and anxiety over his destructive thoughts. These fantasies often remain buried in the unconscious mind of the adult and then come to the surface when psychologic conflicts arise. Therefore, the removal of teeth may have a significance far beyond the superficial, purely mechanical ideas that are usually initi-

ated when we speak of dental extractions. The teeth can no more be divorced from the personality of the patient, so far as psychosomatic medicine is concerned, than any other part of the body.

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PERMEABILITY OF ACRYLICS TO BACTERIA

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AN important requirement of a crown or inlay is impermeability to the passage of bacteria. Unless it were impermeable, the oral flora would penetrate the restoration medium and, under optimum conditions of protection and temperature, would attack the tooth structure within.

The use of methyl methacrylate crowns and inlays is now common. The question therefore arises as to whether this material fulfils the above-mentioned requirement.

PROCEDURES

Eight processed methyl methacrylate capsules were obtained, two from a commercial dental laboratory, and six from A. C. Eglin, professor of crown and bridgework, University of Pennsylvania Dental School. The first two were of clear acrylic, the remainder tooth color. The thickness of the capsules approximated that of a jacket crown, the thinnest portion being about 0.5 mm. The base was broad, for convenience in handling.

In order to obviate possible changes in the material as a result of sterilization, *B. prodigiosus (Serratia marcescens)* was chosen as the first test organism. This bacillus grows readily at room temperature, has a distinguishing redness, is motile, is relatively small (0.5 by 0.5-1 micron) and is not ordinarily present. Use of this micro-organism eliminated the necessity of sterilization. The low temperature of incubation prevents the growth of many of the contaminating organisms, and the test organism can be identified by its color.

A 24-hour culture in bouillon was introduced into each capsule and the top was dropped into a tube of bouillon, the level of which was kept below the junction of the capsule and its cover. (Fig. 1.) Incubation was at room temperature for three to four days. There was no growth of *B. prodigiosus* in the bouillon except in one tube, where the level of the bouillon accidentally came above the level of the capsule, contamination resulting. In every case, the test organism was recovered from within the capsule.

The capsules were washed and sterilized by boiling, and a similar procedure was followed, using equal parts of saliva and bouillon within the capsule, and hormone broth in the test tube. After

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incubation at 37° C. for seventy-two hours, the hormone broth remained sterile in all tubes. Micro-organisms were recovered from within four capsules.

Additional tests were made, using agar plates with sterile methyl methacrylate wells made by cutting off the tops of the acrylic capsules. Saliva and bouillon were placed in the wells. (Fig. 2.) No colonies appeared on the agar, although bacteria were recovered from all the acrylic wells. In four instances,

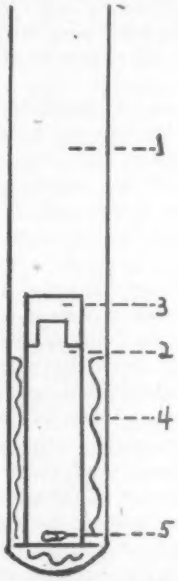

Fig. 1.—1, test tube. 2, acrylic capsule base. 3, acrylic capsule top. 4, sterile culture medium. 5, bacteria and culture medium.

after incubation, the wells were removed and scrapings from the agar beneath the well were dropped into bouillon and hormone broth. No growth followed.

A strain of *Lactobacillus acidophilus* was isolated from a human mouth and placed in sterile capsules and wells as above, the culture medium being modified by the addition of dextrose to promote growth. The organisms could be recovered from within the containers, but not from the surrounding medium.

The highly compressed surfaces of crowns and inlays are often removed to seat the restoration or to adjust the occlusion. Does grinding the surface affect permeability? The question was answered by grinding a portion of two capsules both inside and outside with a carborundum stone. No micro-organisms could be recovered through these preparations.

To determine whether these findings were the result of an antibacterial property of the material itself, plates were made from agar inoculated with saliva. Pieces of methyl methacrylate of varying size were placed in the center of each. Colonies grew around the acrylics as freely as elsewhere on the plates.

A technic of packing and curing acrylic restorations in the mouth has been suggested.[1] To study the permeability of such restorations, capsules containing *B. prodigiosus* were sealed with

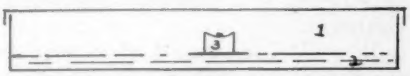

Fig. 2.—1, petri dish. 2, agar. 3, acrylic well.

unprocessed methyl methacrylate. The seal was burnished with a hot instrument and capsules were immediately placed in test tubes so that the culture medium covered the seal. Heavy growths appeared outside the capsules in forty-eight hours; but whether the seal was imperfect or the material was porous could not be ascertained. Accordingly, four wells of unprocessed methyl methacrylate were placed on agar plates and allowed to set at room temperature for twenty-four hours, when a culture of *B. prodigiosus* in bouillon was placed in each well. The organism appeared on the agar in three days.

CONCLUSIONS

1. Properly processed methyl methacrylate is impermeable to *B. prodigiosus*,

1. SALISBURY, G. B.: *D. Digest*, 49:14-17, January; 110-114, March; 261, June 1943.

an oral strain of the lactobacillus and the cultivatable oral flora.

2. Grinding the surface does not affect this property.

3. The material does not inhibit the growth of bacteria.

4. Impermeability depends on proper processing.

PROBLEM OF ANCHORAGE IN THE TREATMENT OF MALOCCLUSION

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WHEN one speaks of the development of a philosophy of treatment of malocclusion, actual mechanical treatment is but one of several parts that go to make up this philosophy. Involved as it may seem, it cannot be otherwise, for we are all agreed, I think, that a knowledge of fundamentals is necessary before one can attempt the selection of a means or a method of mechanical treatment.

It would seem logical, then, that, in mechanical treatment, one finds a method of expressing the philosophy that he has developed. The necessity of knowing what we want in the finished result and of being master of a method or a technic which will allow us to attain our goal cannot be stressed enough.

Most of us, I am sure, have developed a philosophy of treatment, based upon our training, our experiences and our associations with others of the orthodontic profession. It is something that is a part of us and is the sum total of this training, of our experiences and our associations over a period of time.

As I see it, the treatment of malocclusion includes so many factors that it is difficult to isolate one in particular. Nevertheless, it is the purpose of this paper to deal, in a generalized manner, with a purely mechanical aspect of treatment which we choose to term anchorage.

So long as we resort to the use of mechanical appliances for the treatment of malocclusion, the consideration of anchorage will be a fundamental principle, and the correct application of anchorage possibilities, a major problem.

If we are to undertake to correct malocclusion mechanically, it seems necessary that each of us have in mind some valid reason for doing so. I believe most of us would agree that the prime objectives could be listed as: 1. A pleasing and nice arrangement of the teeth. 2. A denture in normal occlusion and functionally efficient and stable enough to withstand the test of time. 3. A face that is within the limits of harmony and balance. If we cannot attain these, I see no reason for attempting the correction of malocclusion at all. Tweed has listed six requirements to be met if normal occlusion is to result from our efforts:

1. A full complement of teeth, each tooth to occupy its normal position.

2. Normal cusp and occlusal relationships.

3. Normal axial inclination of all the teeth.

4. Normal relationships of the teeth to the jaw bones.

5. A normal relationship of the jaw bones.

Read at the Seventy-Ninth Annual Midwinter Meeting of the Chicago Dental Society, February 23, 1943.

6. Normal function of all the associated parts.

I am convinced that Dr. Angle had all of these requirements in mind when he gave us his definition of "the line of occlusion."

One must admit that the end-result of orthodontic treatment depends on its many factors, and a careful study of unsuccessful results is quite apt to uncover some valuable clues pointing to failure to adhere to definite mechanical principles. It is difficult to conceive that an operator may institute mechanical treatment without a thorough analysis of the case at hand and a carefully designed plan of treatment. Many failures can be attributed to neglect of one or both of these requisites. On the other hand, the lack of proper anchorage or the failure to utilize all anchorage possibilities may often lead to a discouraging result, and later to complete failure.

Important as this subject is, not a great deal in this regard has been contributed to orthodontic literature. In its true mechanical concept, anchorage is resistance to a force. Were it possible to confine orthodontic thought to mechanics, one of even medium ability would meet few, if any, problems in regard to anchorage. We are faced, however, with biologic relationships that, to some degree, modify our mechanical concepts. The forces arising from appliance manipulation are transmitted to the tooth and eventually grounded in bone, which thus becomes a primary consideration, and a controlling factor. A study of bone and its growth, formation and reaction to force will lead us to the part that this substance plays in our problem of anchorage. Since it is ever ready to change its architectural pattern upon stimulation, even of the slightest nature, that true anchorage is not available within the mouth becomes apparent.

One should not become too definite in regard to remarks about the normal. It would be difficult indeed to draw a fine line and point that out as the position of the denture in its normal relation to the skull. It does not seem too much out of line, however, to suggest that each case should present a finished picture to the mind, as to the position of the teeth, both esthetically and functionally, fitting into a face that answers our requirements as to balance. Once this picture has been recorded, every effort should be made to attain it.

The two general classes of intra-oral anchorage, from which all other types arise, are simple and stationary. In simple anchorage, the attachment to the tooth is such that when force is applied, the tooth will tip and, in stationary anchorage, the attachment to the tooth is such that the tooth will move bodily, if at all. Thoughtful consideration or analysis of the case at hand with regard to the types of anchorage required, or a combination of types required, is, of course, a step of primary importance.

It is true that different types of malocclusion offer problems of a different nature in regard to anchorage, the so-called simple malocclusion offering less of a problem than the advanced case. It might be well to consider, however, that any case of malocclusion to which mechanical treatment is being applied becomes just as much of an anchorage problem as does any other case requiring mechanical treatment, and every possibility of force control embodied in the appliance used should be carefully thought out beforehand.

Taking this into consideration then, I have adopted the policy of regarding each and every case as a distinct problem in anchorage. I have, therefore, virtually ceased to think of any malocclusion as simple in respect to its treatment. Many times, two cases of seemingly different nature will present problems wherein similar forces are applied as to amount, direction and duration. It would not seem wise to expect the one

case to meet anchorage requirements better than the other.

While it is true that certain individual teeth will offer greater resistance than others, also that certain groups of teeth together will offer greater resistance than one tooth or other groups of teeth, we should not lose sight of the fact that there is no true anchorage within the mouth, and even with a perfected attachment, stationary anchorage will give way or break down if not given proper consideration.

While it would be an impossibility to analyze here each anchorage problem that presents itself to the orthodontist in everyday practice, an understanding of the few general principles of force control will serve to great advantage in nearly every case that we are called upon to treat.

A careful analysis of the relation of mandibular teeth to their base (bone) in most Class I, Class II and bimaxillary protrusion types of malocclusion will reveal a varied amount of forward tipping of the buccal teeth and labial inclination of anterior teeth. Also, in some instances, there is extreme rotation in the anterior segment or breaks in the continuity of the arch.

In the great majority of cases of these types, it has been my experience that the use of Class II intermaxillary elastics will have to be instituted at some time during treatment. We are all aware of the reaction of the mandibular teeth to the use of these elastics. Yet, in many instances, we have begun to correct the irregularities in the lower anterior segment while using Class II elastics, and have not merely disregarded the forward movement of the mandibular teeth, but have also accentuated it.

In regard to this forward movement, I should like to give consideration to a very common type of malocclusion, Class II (Angle), and all cases that require Class II mechanics in their treatment. Generally speaking, our object in these cases is to move the maxillary teeth distally while holding the mandibular teeth stationary, with the final result of developing the mandible forward. It seems that our main problem is the creation of stationary anchorage in the mandible and the breaking down of stationary anchorage, or resistance, in the maxillae.

Frequently, upon careful examination, the treated case will display certain features to remind us that our carefully mapped out plan of treatment has not worked out exactly as desired. In other words, the mandibular teeth have been moved or tipped forward to a degree sometimes greater than that of distal movement of the maxillary teeth. In my opinion, the result that shows this characteristic is neither esthetically nor functionally as successful as it might be, and certainly the denture cannot be classed as stable.

It does not seem judicious to institute force against the mandibular teeth that might tend to increase their forward movement. The wiser procedure would be, first, to place these teeth in a more favorable position, for it must follow that, if anchorage is too far forward at the beginning of a forward driving force application, it will certainly be too far forward at the conclusion. The uprighting of the lower anterior teeth until they are solidly over the bony base, and the alteration of the axial inclination of the lower buccal teeth, especially the anchor tooth, until a distal tipping is evident is, for these teeth, the position to best withstand the force exerted by the Class II elastics.

Because this question has been brought up before me many times, I should like to answer it in my own way and a little more fully. I do not believe that, in all malocclusion, the mandibular incisors are inclined too far labially. In many Class I and Class II cases, the mandibular incisors are in or very near their correct positions over basal bone, even though they present some labial inclination. On

the other hand, in many of these cases, these teeth are inclined too far labially. Why, then, one may ask, is it necessary to treat all cases the same? Bear in mind that in one type of case the mandibular incisors are in labial malposition, while in the other they are practically normal. This, to me, is an anchorage problem. In the one case, the teeth are moved lingually because they are in malposition to begin with, as well as presenting an anchorage problem. In the other case, they present merely an anchorage problem and are moved to an upright position or inclined slightly lingually to safeguard against labial tipping during further treatment.

The analysis of the Class II, Division 1, malocclusion will often reveal maxillary teeth with mesial axial inclination and a varied degree of flaring of the anterior teeth. The mechanics of teeth placed thus is such that they already possess a degree of resistance to efforts to move them distally. If this is the case, it does not seem unwise to break down this resistance by the alteration of the axial inclinations of the buccal teeth until they are even inclined distally, and to reduce the flaring of the anterior teeth. I believe this should be done before the application of force to move them distally *en masse*.

To attempt a correlation of this concept with our knowledge of biologic principles is difficult indeed. Nevertheless, clinical results tend to show that these mechanical procedures come very close to answering the problem. This is nothing more than the utilization of all anchorage possibilities, which, to reiterate, is of greatest importance.

On the other hand, the procedure allows a minimum use of elastics, or the motivating force, to which there is an equal reaction on the part of the mandibular teeth. In this respect, the loss or breakdown of anchorage may, in many instances, be attributed to the use of force over a great period of time, no matter what the anchorage problem or the motivating force.

The general principles involved in the creation of force control, just discussed, seem applicable in nearly every case of malocclusion that we are called upon to treat. These principles are: the building up of anchorage in areas in which the greatest resistance is desired, the breaking down of resistance in areas in which movement is desired and the utilization, for as short a time as possible, of any motivating force that will ultimately cause anchorage to give way.

Since individuals differ greatly in their makeup, it is difficult to predict action and reaction exactly in every case. In some instances, it has been my experience that anchorage will not break down even under the most unfavorable circumstances. In others, the most painstaking efforts and continual vigilance are necessary to keep the desired stable units intact. This situation should only serve to make us more thorough in our application of anchorage possibilities in each and every case.

The use of extra-oral anchorage is nothing new to the science of orthodontics. It has been used and discarded many times during the course of progress of our profession. Its use as a means of moving teeth has not been given a thorough test in my practice, although it might be said to offer unlimited possibilities. As a means of augmenting anchorage, however, I see it as one of our most valuable aids.

The headgear as we now know it finds its origin in what for years has been called occipital anchorage. The construction of the headgear has now been made a simple process, and its use can be instituted with a minimum of discomfort to the patient. It can be constructed so that its force is obtained either from ribbon elastic from the back of the neck or from rubber elastics to material at the side of the face. In any case, the pull is so adjusted that it acts along the occlusal

plane. As an aid to the establishment of anchorage, it has been used in my practice mostly to offset the force of elastics used within the mouth, and it can be made to exert any amount of pressure desired.

In explanation of this, I spoke, in a preceding paragraph, of placing the mandibular teeth in a more favorable position before the use of Class II elastics. It is sometimes difficult to upright lower anterior teeth and to tip buccal teeth distally simply by means of appliance manipulation. In these cases, it has been my policy to use Class III elastics as an aid in pulling these mandibular teeth back. To offset the forward force of these elastics on the maxillary denture, a headgear may be constructed to act directly, with a distal pull, on the appliance being used upon the maxillary teeth. The force of this distal pull can be regulated, as the case demands, to exactly equal the force created by the Class III elastics or to create a greater pull. In most instances, it is desirable to regulate the force of the headgear so that it is twice as great as the force of the Class III elastics.

It has been found that the use of the procedure outlined above for about ten to twelve hours a day is sufficient to obtain the desired results.

It would be unwise to discuss anchorage without a few words about the use of the second permanent molars, which has been in the past largely overlooked. It has been almost universal practice to limit our treatment of malocclusion to the dental arches from first molar to first molar, even when second molars are present. In the progress of the science of orthodontics, we have been called upon to consider more than the mere alinement of teeth in the dental arches. Our obligation demands that we place the teeth, as far as possible, in proper position as regards esthetics and function, and that the denture shall be stable and in balance. Certainly if this obligation is to be fulfilled, the second molars must be taken into consideration. Often, serious malocclusion is present in the second molar area at the time treatment of the case is instituted, and too often this is ignored. The establishment of correct buccal-lingual position, vertical relation and axial inclination of these teeth is essential if the denture is to be in balance.

As a unit of anchorage, the second molars are of great importance and a valuable addition to the possibilities. They aid materially in the use of reciprocal anchorage to expand the buccal segments anteriorly from them. Their use in this respect tends to reduce the amount of mesial drift in the dental arches, thus eliminating one of the most undesirable factors in the treatment of malocclusion.

In the treatment of Class II cases, inclusion of the maxillary second molars makes it possible to exert a distal pressure directly upon these teeth. When these teeth are not included, the distal pressure upon them must come through their contact point with the first molar.

The mandibular second molars, as the anchor teeth in Class II cases, offer the use of their long roots embedded in the dense bone close to the ramus as an added anchorage possibility. Furthermore, they must be considered as the addition of two more teeth to the unit of anchorage in the mandible.

The method of mechanical treatment that I have used is the edgewise arch mechanism as conceived by Dr. Angle and methods later modified by Charles H. Tweed. It should be understood, however, that the anchorage problems discussed in this paper are not peculiar to the edgewise appliance, but are peculiar to malocclusion, and that the appliance named offers an excellent method of combating anchorage problems if it is used with consideration of all of its possibilities.

I have tried to set forth the most

common problems encountered in everyday practice. While it is true that each specific case presents its own anchorage problem, there exist a few general conditions which, when taken into consideration, work as aids and, when ignored, cannot but intensify what is already a difficult situation. From my experience, I would list these factors thus: (1) that teeth to be used as anchorage should first be placed in their most advantageous position to resist force; (2) that teeth to be moved should be placed so that they offer the least amount of resistance; (3) that the force used to create movement of teeth should be steady, yet ample, and should be used for as short a time as possible; (4) that the problem at hand should be analyzed thoroughly beforehand and then worked out immediately according to a plan, for, as I see it, procrastination during the treatment of malocclusion only leads to embarrassment and a loss of force control later on, and (5) that every anchorage possibility offered by whatever mechanical means used should be studied carefully and employed.

To sum up briefly: It is absolutely necessary for each of us to have a distinct picture of what we wish to attain in every case that we treat, as well as a clear understanding of what constitutes the so-called normal. A knowledge of fundamentals is necessary before one can choose any of the various methods of mechanical treatment. Once the picture is clear, the method should be selected and all its possibilities for attainment of the desired result should be recognized.

I do not believe that it is necessary for every one to agree with me as to what constitutes the ideal result; but I believe that we cannot be so far apart that all comparison is lost.

I believe that, recognizing certain limitations in the treatment of malocclusion, if my case analysis and treatment plan are correct, and if anchorage is carefully watched and controlled, I can attain my goal in treatment. In other words, I have at my disposal an appliance and a method of using that appliance that gives me control over the case, not the case control over me.

There is such a thing as building up anchorage units in areas in which no movement is desired. The correct utilization of all the possibilities stored up in this mechanism can result in the creation of mass anchorage, which is the nearest approach to stationary anchorage that can be found within the mouth.

It is possible to move mandibular teeth too far forward during treatment even if they are not too far forward before treatment is instituted, or they may be positioned and kept from moving too far forward if the possiblities of force control are properly used.

In closing, I should like to quote from the last paragraph on anchorage in Dr. Angle's seventh edition:

> Finally, the variations in the application of the various forms of anchorage are so many and important that they should be constantly considered in the treatment of each and every case. To the thoughtful orthodontist, the possibilities in the delicate shadings of force and anchorage, like that of harmony to the artist in music, are ever widening.
>
> With the novice, much of importance in anchorage might be lost sight of altogether, or possibly recognized only too late. But, as his skill develops, he will learn to weigh the problems of anchorage in each case most carefully. He will seek to utilize every possible advantage, which he will anticipate far in advance of his immediate needs, and in proportion as he is capable of comprehending and skillfully taking advantage of the possibilities of anchorage, to a very large extent, will ease of treatment and certainty of success be developed. The strings of a violin are but four, but their possibilities in music are immeasurable.

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USE OF FLUORINE IN THE PREVENTION OF DENTAL CARIES

I. RATIONALE AND APPROACH

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MOST of the outstandingly successful methods of preventing disease are those which have had their origins in naturally occurring phenomena of immunity. Vaccination against smallpox, for instance, is a direct outgrowth of the observation that this disease was prevented by infection with cowpox. Immunization against diphtheria is, in a less direct way, an example of the same sort; but, with this disease, practical prophylactic methods could not be established until exact theoretical explanations of the basic reactions between toxin and antitoxin had been worked out.

The story of malaria, pellagra, rickets and many other diseases furnishes further examples of practical methods of control which have resulted from the working out of causal relationships from the study of naturally occurring phenomena of susceptibility or resistance. Indeed, it is seldom that prophylactic procedures can be brought to a practical state without a thorough understanding of the underlying mechanisms responsible for the natural immunity. Three steps can generally be recognized in such a development: (1) studies on epidemiology and the phenomena of natural resistance; (2) discovery of the mechanism by which this resistance is brought about, and (3) the working out of methods of utilizing these mechanisms for preventing disease in otherwise susceptible groups. Apparently, this step by step approach has never been fully recognized or conscientiously followed in attempts to work out methods for the control of dental disease. In recent years, sufficient epidemiologic and other evidence has accumulated on the subject of the relationship of fluorine to dental caries to make it profitable to follow the approach outlined above in considering the possibility of preventing caries by some type of fluorine therapy. The remainder of this paper is devoted to such an analysis of our knowledge of the relationship of fluorine to dental caries.

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PHENOMENA OF CARIES RESISTANCE IN RELATION TO FLUORINE

The findings in (a) epidemiologic studies, (b) chemical studies and (c)

animal experiments demonstrate convincingly that fluorine acts in some way to prevent dental decay.

Epidemiologic Studies.—For many years, evidence has been accumulating which suggested that, in addition to causing mottling of enamel, fluorine in drinking water also contributed in some way to a reduction of caries. In a series of publications, Dean and his associates have demonstrated that amounts of fluorine below those which cause mottling of enamel would cause a marked reduction in caries activity. The most recent report,[1] which summarizes many of the previous studies, shows that, in twenty-one cities, there was an inverse relationship between the fluorine content of drinking water and the amount of dental caries. Children in cities with one part per million or more of fluorine in the water had only one-third to one-half the caries that children had in cities having a fluorine content of less than 0.5 part per million in the water. It is particularly interesting that this report shows a reduction in caries much more marked in the upper incisors than in other teeth. Communities with fluorine levels above 0.6 part per million had only one-nineteenth of the amount of incisal caries that was present in those using waters with less than 0.5 part per million. In the same groups, the reduction of decay in the molars was only one quarter of that in the incisors. This marked effect on the incisor caries accounts adequately for Arnim, Aberle and Putney's[2] failure to find a single carious incisor in a thousand Indians examined in an area of endemic fluorosis and, as will be pointed out later, casts light on the mechanism of fluorine action. The low occurrence of dental caries in association with fluorine in drinking water is now a well-recognized clinical phenomenon, noted in many parts of the world. Sognnaes' report[3] of the dental conditions in Tristan da Cunha is the only one of a situation in which a high fluorine content in the food (contained in fish, which was the principal item in the diet) has acted to prevent caries.

Chemical Studies.—It has been shown that caries-resistant teeth have a higher fluorine content than do caries-susceptible teeth. Armstrong's figures[4] for caries-resistant teeth are: enamel, 0.0111 mg., and dentin, 0.0169 mg., per hundred cubic centimeters; and for caries-susceptible teeth: enamel, 0.0069 mg., and dentin, 0.0158 mg., per hundred cubic centimeters. In view of ideas to be developed later in this paper, it is important to note that the principal increase of fluorine in the caries-free teeth was in the enamel and that the increase in the fluorine content of the dentin was negligible.

Animal Experiments.—Although experimental caries in rats bears only a slight resemblance to human dental decay,[5] it has, until recently, provided the only practical means of studying caries by animal experimentation. Obviously, because of the differences between this condition and human caries, conclusions from this source must be accepted with caution. Nevertheless, the demonstration by a number of workers[6, 7] that rat caries can be prevented by adding fluorides to the drinking water or food or by intra-oral administration even without ingestion[8] must be regarded as additional strong evidence that fluorine can protect the teeth against caries. Other studies on rat caries, which will be referred to later, have contributed to an understanding of the mechanism by which fluorine prevents decay.

The foregoing summary of the findings in three different fields of scientific study shows clearly that fluorine acts in some way to prevent caries in man, and that, as a result of this action, a natural resistance to caries occurs in large population groups. Thus, dentistry is presented with a phenomenon of naturally occurring disease resistance and is given an opportunity to interpret this phenomenon

so that it can be turned into an effective and practical method of caries prophylaxis.

MECHANISM BY WHICH FLUORINE PREVENTS DENTAL CARIES

In considering the possible ways by which fluorine could prevent or limit the progress of dental caries, one has to recognize the views both of those who believe that caries is the result primarily of systemic conditions and of those who believe that changes on the tooth surface are all-important. These possibilities can be adequately dealt with by considering, under three heads, the different mechanisms so far suggested for the action of fluorine: (1) that the systemic effects of fluorine on the erupted or unerupted teeth bring about changes which increase their resistance to caries; (2) that fluorine acts through the saliva to add to the resistance of the teeth or weaken the attack of caries, and (3) that fluorine influences the mechanism of acid production and tooth decalcification at the tooth surface.

The Systemic Effects of Fluorine.—Unerupted teeth: Early studies[9] on rats indicated that animals fed a high fluoride diet before the teeth erupted were less susceptible to "experimental caries" than rats not receiving a fluoride supplement. It was inferred from this that caries resistance in man was also the result of preeruptive changes in the teeth brought about by ingestion of fluorine. There are two reasons for questioning this conclusion: First, as has already been pointed out, "experimental caries" in rats is not completely comparable to human caries and the findings have only a limited significance for man. Second, similar studies[10] have had contradictory results. An indication that fluorine taken during tooth formation may influence caries activity in human beings can be found in Dean's observation[11] of an apparent added resistance to decay in children of Bauxite who had used fluorine-containing water only during the early years of life. The extent of caries reduction resulting from use of fluorides during the first eight years of life (which must of necessity include posteruptive effects on certain teeth) is apparently less than half of that resulting from use extending into adult life.[12] That factors operating after tooth formation are more important than those operating during that period is suggested by the fact that caries reduction in the first permanent molars is only about one quarter of what it is in the incisors[1] despite the fact that the two types of teeth are formed at the same time of life.

Erupted Teeth.—Because enamel and dentin are almost completely inert tissues, it seems unlikely that caries is prevented by metabolic effects of fluorine on the teeth. However, since there is accurate experimental evidence,[13] obtained by the use of radio-active isotopes, that phosphorus turnover in the enamel is as much as 10 per cent of that in the dentin and 2 per cent of that in the alveolar bone, the possibility of some low-grade metabolic influence must be admitted. Animal experiments[14] have shown that some radio-active fluorine enters the teeth from the blood stream or saliva, but, in addition, they have demonstrated that this element is not concentrated in either the enamel or the dentin in the same way that it is in the bone. Further, because the bulk of ingested fluorine is rapidly excreted in the urine,[14] the amount reaching the teeth is certainly minute enough to have very doubtful significance. This is particularly true when it is recalled that the fluorine would have to be concentrated in the enamel if the distribution of fluorine associated with caries resistance in man[4] were to obtain. There is evidence[5] that this does not occur when fluorine is fed to animals. On the other hand, such administration of fluorine to rats does increase the fluorine content of the dentin.[15] (The reduced occurrence of "ex-

perimental caries" in rats associated with this fluorine increase in the dentin is almost certainly explicable on the basis of the difference between "experimental caries" and human caries.[5])

Salivary Effects of Fluorine.—Because it is in continuous contact with the tooth surfaces and because it may reflect systemic conditions, the saliva has to be considered as a possible intermediary agent in the action of fluorine. Studies with partially desalivated rats led Cheyne[16] to conclude "that saliva is of vast importance especially as it acts to transport the caries-inhibitory factor." However, in a reinterpretation of the same experiments,[17] he abandoned this opinion. Sognnaes expanded the same experimental approach, using local applications[8] and stomach tube administration of fluorides, and was able to demonstrate that the presence or absence of salivary glands did not influence the progress of caries in rats, thus indicating that the saliva was not the instrument by which either local or systemic effects of fluorine were brought about. A further indication that saliva is unimportant is found in studies with radio-active fluorine[14, 19] which revealed that great increases of fluorine in the blood do not significantly change the fluorine content of the saliva. The absence of differences between the fluorine content of saliva of children using fluoride-containing water (low caries) and children using fluorine-free water (high caries) supports this conclusion.[20] Finally, the most striking evidence that saliva is of no importance in bringing about fluorine resistance to caries is found in the previously recorded clinical studies[1] that fluorine is four times as effective in reducing caries in the upper incisor teeth, where salivary influences are at a minimum, as in the molars where this effect is maximal. When considered together, these findings establish definitely that caries reduction by fluorine is brought about without the intermediary action of saliva.

3. *Effects of Fluorine on Acid Production and Acid Resistance of Teeth.*—Recent studies[21] on various aspects of dental caries have greatly strengthened the idea that this disease is primarily the result of the destruction of enamel and then dentin by the action of locally formed acids. It is conceded that a variety of local and systemic conditions modify the speed of tooth destruction, but as yet no mechanism for tooth destruction other than the action of acid has been demonstrated. Consequently, considerations of local factors in caries must deal mainly with the effects of fluorine on the formation of acids, and its possible influence on the resistance of enamel and dentin to acids. A fuller discussion of these questions has been presented elsewhere.[22]

Acid formation: Since the formation of acids in the mouth is the result of decomposition of carbohydrates, it is necessary to consider the effects of fluorine on this process. There is no reason to believe that fluorine interferes with the breakdown of starches to sugar. Indeed, McClure[23] has shown that concentrations of fluorine such as might be met with in the mouth cause no limitation of diastatic activity, and that the saliva of children using water with 1.8 parts per million of fluorine does not differ in its ability to break down starch from that of children using fluorine-free water. There is, however, much evidence[24] that fluorine can interfere with the later and more important phase of carbohydrate breakdown, the formation of acids from sugar. Fluorine contained in fluorosed teeth has a kindred effect. It is possible, therefore, that this action of fluorine may contribute toward a reduction in the activity of caries.

Tooth resistance: Fluorine might add to the resistance of the teeth by acting in some way to increase the capacity of the teeth to repair themselves. Laboratory and clinical evidence that this type of reaction does not

occur has been offered earlier in this paper.

Again, incorporation of fluorine in the teeth, regardless of its manner of acquisition, might add to their ability to withstand the action of mouth acids. That this is very likely is suggested by the action of fluorine in reducing the solubility of rock phosphate.[25] That a similar effect is actually brought about on the teeth by fluorine was demonstrated by Volker.[26] When this is considered, in conjunction with the findings[4] that human teeth with a high fluorine content in the enamel are more resistant to decay than those with less fluorine, we have the strongest kind of evidence that the caries resistance associated with fluorine is primarily the result of an increased content of this element in the dental enamel. Of all the possibilities considered, this seems to be the only one which adequately explains all of the clinical and laboratory findings. The increased fluorine in the teeth could delay caries either by adding to their acid resistance or, to a lesser extent, by limiting acid production in the immediate vicinity of the enamel.[24] We must conclude, then, that this is the principal way in which fluorine acts to reduce dental caries.

Manner of Acquisition of Fluorine by the Teeth.—Since the evidence offered so far indicates that salivary action and preeruptive or systemic influences on the teeth are relatively unimportant in influencing fluorine resistance to caries, the conclusion just reached is essentially a negative one, unless an explanation of how the fluorine reaches the enamel is provided. Fortunately, a satisfactory answer can be supplied.

For some time, there has been evidence in the literature that bone combined actively with fluorides. Half a century ago, Carnot[27] demonstrated that the fluorine content of bone was increased by immersing it in fluoride solutions. This reaction between fluorides and bone phosphates is apparently a very active one because contact with bone[28] or hydroxylapatite[29] will remove fluorine from drinking water. That the chemically similar phosphates of tooth enamel and dentin react similarly was demonstrated by Volker, who, using radio-active isotopes and solubility tests, showed that a short exposure of enamel and dentin to fluoride solutions resulted in a rapid reaction with fluorine,[30] causing a marked reduction in their solubility in acid.[31] Recently, this key finding that fluorine combines actively with the teeth has been confirmed by chemical analysis of teeth immersed for short periods of time in sodium fluoride solutions[32] or brushed with fluorapatite.[33] From this evidence, it may be concluded that a lowered acid-solubility of the teeth results from an increased fluorine content of the enamel and dentin, which is brought about principally by a direct reaction between the fluorine of fluorine-containing water and the tooth enamel, independently of the ingestion of fluorine or its absorption into the system. Additional support for this conclusion can be found in the experiments of Perry and Armstrong[34] and Sognnaes.[5] The former showed that increases in the fluorine content of the enamel of rats' teeth resulted from direct contact between the teeth and fluoride-containing drinking water and not from passage of the fluorine into the system. The latter demonstrated that caries in rats could be prevented by direct applications of fluorides to the teeth even when none of the fluoride was swallowed.

This explanation of the mode of action of fluorine is in complete accord with clinical findings. If a direct combination takes place between the fluorine of the water and the tooth enamel, the degree of protection accorded to the different teeth should be proportionate to the extent of their contact with the water. Thus, the upper anterior teeth which come in greatest contact with the

fluoride-containing water during the act of drinking should be most benefited, whereas other teeth, such as the molars, which have less contact with the water, should show less caries reduction. The clinical studies[1] quoted at the beginning of this paper show that this is the case, the reduction of caries in the upper anterior teeth being more than four times greater than that in the molars.

Conclusion.—The contents of the foregoing section can be briefly summarized by stating that attempts to explain the action of fluorine in preventing dental caries on the basis of its effects on tooth formation, tooth metabolism or salivary action were unsuccessful, but that a satisfactory explanation, which is supported by all existing laboratory and clinical evidence, is provided by postulating that the increased resistance to caries is the result of a direct acquisition of fluorine by the tooth enamel from fluorine-containing waters or foods. This is apparently the result of a peculiar affinity which exists between calcium phosphates of the sort occurring in bones and teeth and fluorine, which results in a rapid reaction between fluorides of the water and the teeth. When fluorine combines with enamel or dentin, it greatly reduces their solubility in acid. This increased resistance to the action of acid is probably the primary cause for the reduction of caries in teeth which have come in contact with fluoride-containing waters.

UTILIZATION OF FLUORINE IN THE PREVENTION OF DENTAL CARIES

It seems that the simplest and most direct approach to the use of fluorine to reduce caries would be an increase of the fluorine content of the water supplies in caries-susceptible areas so that it would be the same as that of communities with little decay. If there were no complicating factors, which there almost certainly would be, this could be accomplished by adding fluorides to the water to bring about a fluorine content of one part per million. Such concentrations of fluorine should reduce caries activity without causing mottling of the enamel. The use of fluorine supplements in water supplies has been advocated by Cox[35] as a means of combating dental decay. Experimental tests of this procedure are under consideration at this time.

One disadvantage of adding fluorine to the water supply is that there is reason[36] to believe that a fluorine supplement in a soft water would be absorbed to a different extent from that present when the same supplement was added to hard water or occurred naturally. Further, individual variations in water consumption, diet or metabolism would probably produce uneven results in different children. These factors make it difficult to establish a universally satisfactory level of fluorine intake which will confer the advantages of caries prevention without the risk of producing mottling of the enamel or other as yet unknown undesirable effects which may result from continuous ingestion of fluorine. Another disadvantage of this approach is that the greatest caries reduction which could be expected to result from using drinking water containing 1 part per million of fluorine, a concentration which produces sporadic mild mottling of enamel, would be no greater than the approximately 50 per cent reduction shown to result[1] when like concentrations of fluorine occur naturally in the water. A reduction of caries to one-half is, of course, no more the desideratum than the direct infection with cowpox was the ultimate achievement in the prevention of smallpox. The aim in programs of caries prophylaxis should be to reduce caries in all teeth at least to the extent to which fluorine reduces decay in the anterior teeth; namely, by from 90 to 95 per cent of its normal incidence.[1] To accomplish this, it seems obvious that more refined methods of use than simple

addition to the drinking water must be worked out.

In consideration of the mode of action of fluorine, it was concluded that the anterior teeth showed their phenomenal resistance to caries because they alone came into repeated direct contact with fluorine-containing water. Therefore, because the reaction between fluorine and the enamel is a very rapid one, it seems likely that direct applications of fluorine-containing fluids to the teeth would reduce caries. Moreover, if our conclusion on the mode of action of fluorine is correct, the extent of the reduction should be approximately equal in all teeth.

This possibility has recently been tested in a clinical study in Brockton.[37, 38] Three times a year for two years, applications of 1/1,000 sodium fluoride were made to the teeth of one of the four quadrants of the jaws of a group of 100 children, and the progress of caries was compared with that in the opposite (control) quadrant of the same jaw. Reexamination at the end of the first and second year showed a striking reduction of caries in the treated quadrants. In the test quadrants of eighty patients completing two years of treatment, eighty-three new cavities appeared; whereas, the corresponding untreated control quadrants in the same jaw, but other side of the mouth, there were 124 new cavities. There was less difference in questionable caries (fillings, questionable caries and cavity enlargements), the test and control figures being 90 and 115. The reduction of caries in the molars (40 per cent) and bicuspids (33 per cent) was essentially the same as in the anterior teeth (34 per cent).

These results, which have received confirmation in a more limited study,[34] not only prove the correctness of our general conclusion regarding the mode of action of fluorine and the accuracy of our explanation of the different degrees of caries reduction in incisors and molars when fluorine is taken in the drinking water, but also show that application of fluorine directly to the teeth will reduce caries, even though it is not taken into the system. There is no reason to believe that the caries reduction brought about in our study represents the best result obtainable by this general method. Since contact with fluorides in the drinking water reduces caries in the anterior teeth by as much as 95 per cent,[1] it is not unreasonable to expect that a similar reduction could be brought about in all teeth when improved methods of making local applications are worked out.

It is possible that this end could be accomplished either by giving more frequent fluoride treatments or by increasing the reactivity of the fluorides. The former could be accomplished (a) by having dentists or dental hygienists give frequent treatments, or modified treatments, of the kind given in the Brockton experiment; (b) by having patients apply fluoride-containing preparations to their own teeth as part of their regime of oral hygiene, or (c) by subjecting the teeth to a concentrated series of fluoride treatments during a period of a few days. All these methods are now being investigated in various parts of the country, and the relative effectiveness of each approach should soon be known. We have been able to make some progress in the latter direction[40] and will report progress toward increasing the solubility reducing effects of fluorides in another paper.

The foregoing represent only a few of the possible ways in which fluorides can be used to control caries. It is likely, for instance, that the reaction between fluorine and the teeth could be increased by means of electrophoresis, thereby bringing about a greater reduction in tooth solubility. It is also probable that a prolonged contact of fluorides with the teeth and a resultant increase in the solubility-reducing effect could be brought about by incorporating fluorides in such materials as celloidin, which would adhere

to the teeth for long periods of time. These represent only some of the methods which could be used to bring about solubility-reducing effects on the teeth. Until these and other approaches have been thoroughly investigated, it will be too soon to conclude that it is impossible, by means of direct fluoride treatments of the teeth, to reduce caries in all teeth to the extent that fluoride impregnation from the drinking water reduces it in the anterior teeth.

GENERAL SUMMARY AND CONCLUSIONS

The thesis is advanced that the most profitable approach to disease prevention is through the study and interpretation of natural phenomena of disease resistance.

Evidence from clinical studies, chemical analyses of teeth and animal experimentation is quoted to show that a naturally occurring phenomenon of resistance to dental caries is associated with the action of fluorine.

The evidence relating to the possible ways in which fluorine could act to prevent dental caries is examined. It is concluded that its action is principally the result of an increased fluorine content of the tooth enamel which is not brought about by preeruptive or subsequent systemic effects on the tooth. This fluoride increment in the enamel makes the teeth less soluble in acids and may also exert a minor secondary effect by reducing acid production by bacteria in its immediate vicinity.

On the basis of geologic data and laboratory experiments with teeth, it is shown that the enamel can acquire fluorine after the teeth are erupted through the medium of direct external contact with fluoride-containing waters. This is offered as the mechanism by which the teeth acquire fluorine and an added resistance to caries.

From this conclusion, it is postulated that treatments of the teeth with fluoride-containing solutions would reduce dental caries. Clinical tests are quoted to show that caries can be reduced by at least 30 per cent by such a procedure.

In a discussion of possible methods of using fluoride therapy to prevent dental caries, it is concluded that the addition of fluorine to water supplies will probably yield a smaller reduction in dental caries than it will ultimately be possible to bring about by refinement of the general method of direct application of fluoride to the teeth.

CONCLUDING COMMENT

The work of establishing the influence of fluorine in controlling dental caries which has been summarized in this paper may well come to be recognized as the most important series of investigations in the recorded history of dentistry. Whether this turns out to be the case or not will depend on the course of research on the subject in future years. At worst, attempts to produce a significant reduction of caries by practical measures of fluorine therapy may fail or produce undesirable results of an unpredictable sort. Disappointment or reaction might then lead to a premature abandonment of this approach to caries control. At best, a number of effective ways of controlling caries by fluorine therapy may be worked out; or information obtained from such studies may lead to effective chemical therapy by agents other than fluorides.

Since it is unlikely that even at its most effective level fluorine therapy will entirely prevent tooth decay, other approaches to caries prevention should be continuously explored. Progress toward prevention can undoubtedly be made by furthering our knowledge of the effects of selection of carbohydrates which do not readily undergo fermentation, or which are rapidly eliminated from the mouth. Initial work in these fields gives great promise and, if fully exploited, might provide successful methods of caries prevention. The immediate possibilities for the control of caries are extremely bright. It is more than likely

that, in the near future, really effective procedures for caries prevention will be available, methods which will make such low demands on time and money that they will be attractive and profitable for patients, dentists and public health organizations alike. That such possibilities are now within our reach should serve as a challenge to all who are able to carry out or support work in the field of dental caries or public health.

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EPULIS: REPORT OF A FATAL CASE

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ALTHOUGH the epulis is a common oral lesion, information concerning it is not so widespread as one might suppose, as is shown by the great number of such lesions referred to us as "possible cancers." Scudder[1] has written "Epulis is a topographic term." It means merely a tumor of the gums. Most clinicians apply the term to that group of peripheral blastomas originating in the soft tissues associated with the supporting structures of the teeth. Some also include in this group some of the lesions that primarily originate in the central portion of the bone and secondarily cause changes in the gum tissues.

It is our purpose to discuss only those gum tumors originating in the soft tissues. Included in this group are (1) the fibroma, (2) the angioma, (3) the angiofibroma and (4) the giant-cell tumor.

DIAGNOSIS

Location.—These lesions occur with approximately equal regularity in the upper and the lower jaw. It has been our observation that they are most frequently seen in the region between the lateral incisor and the first bicuspid tooth, although they may also occur around any of the other teeth. The bulk of these tumors is usually on the facial aspect of the gums.

Gross Appearance.—While there can be wide variation in the appearance of the epulides, there are certain distinctive general features that are characteristic. Most of these lesions appear clinically as a visible swelling in the interdental papilla or gum margin, varying in size from those barely visible to those exceptional specimens that may fill the entire oral cavity if left untreated. (Fig. 1.) As growth progresses and the tumor tissue extends occlusally and laterally, they may become somewhat flattened by pressure from the lips, cheeks or tongue.

The fibroma is smooth and sometimes lobulated and ranges in color from that of the normal gum to various shades of red. However, the majority resemble normal mucous membrane in color. Because of its comparative density, it is not compressible.

The angioma resembles the fibroma in shape and size, but usually shows more lobulation, with a "spongy" appearance, and, owing to its greater vascularity, is redder. It is more friable than the fibroma and tends to bleed readily upon manipulation. It may be compressible. The so-called "pregnancy tumors" fall into this class.

As the name implies, the angiofibroma is a combination of the fibroma and the angioma, presenting an appearance in keeping with its mixed nature.

The peripheral giant-cell tumor is lobulated and soft, usually compressible and more bluish red than the angioma. However, one must keep in mind that the color can vary not only between tumors, but even within the same tumor.

Being benign tumors, these lesions do not metastasize, and regional lymph nodes show a reaction only when the lesions ulcerate and become infected.

The previously mentioned distinctive general gross features of the epulis are, of course, valuable diagnostically. As a rule, pain is not a prime consideration, as is evidenced by the large size that some of these tumors reach before the

From the State Institute for the Study of Malignant Diseases.

patient seeks treatment for the condition.

Roentgenographic studies are important for evidence of alveolar resorption, ill-adapted restorations, the presence of retained roots or malocclusion.

Biopsy and subsequent histopathologic examination are of paramount importance in the diagnosis of gum lesions. The desirable feature of such examination is that not only are diagnosis and treatment facilitated, but also the possibility of error in diagnosis of a malignant tumor is ruled out.

HISTOPATHOLOGY

The epulis has certain histologic characteristics by which it may be classified as a distinct entity.

In fibroma, an increase in the amount

Fig. 1.—Tumor mass protruding from mouth. The tumor, a fibroma, originated in the upper gum and filled the entire mouth.

and density of the connective tissue in a specific location is found. As a rule, the same irritant that causes this hypertrophy also acts upon the overlying squamous epithelium, and we find that while, under normal circumstances, the epithelium would be four or five cell layers deep, under these conditions it may increase to the depth of from twenty to thirty cell layers, and thus a tumor known as a fibropapilloma is produced. If the irritation is directed only at the submucous connective tissue, the surface epithelium will remain in a normal state and the tumor will be a pure fibroma.

In the case of the angioma, we are observing the effect of an action upon the vessels in the submucous area. In the resultant tumor, there is a dilatation, with increase in the number of blood vessels, in the affected area. The picture presented may vary, some fields showing a marked increase in the number of vessels, while other fields show an increase not so pronounced, with definite dilatation of the vessels as the predominant feature.

If, as in the case of the above-mentioned fibroma, the surface epithelium is involved, an angiopapilloma will be found.

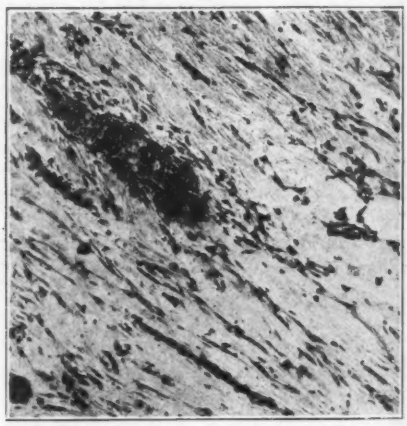

Fig. 2.—Photomicrograph of histopathologic section of tumor shown in Figure 1. The diagnosis was fibroma.

In those lesions in which changes occur in both the connective tissues and the blood vessels, the resultant tumor is called an angiofibroma. When hyperplasia of the covering epithelium is found, the lesion falls into the angiofibropapilloma group.

The giant-cell epulis contains all the active elements of both the fibroma and the angioma. The fibrous connective tissue is of a more adult type; i.e., denser, while the number of vessels found is much greater than under normal condi-

tions. Multinucleated giant-cells are found in the angiofibromatous mass, sometimes being generously interspersed throughout the tumor, but in some instances are few.

ETIOLOGY

Apparently both local and general etiologic factors must be considered in the production of these lesions. Scudder[1] and Anderson[2] have stated that chronic irritation from carious teeth and roots is a definite etiologic factor.

Cahn[3] is of the opinion that "local irritation plays an important part" in the formation of "the common epuloidal variety of fibroma, which arises from the mucoperiosteum about the necks of the teeth"; while Mead[4] has written, "They appear to be caused by irritation or by misplaced embryonic cells."

Ermando[5] mentions chronic local irritation and inflammation as pathogenic features, but states further, "However, the local factor by itself is insufficient to explain the appearance of epulis; the germ factor has been invoked by some authors, while others have lent importance to general factors such as disturbances of the blood, heredity, autointoxication, syphilis, tuberculosis and endocrine dysfunction."

Since the growth of certain types of induced or spontaneous tumors in experimental animals can be influenced by doses of ovarian hormone, and there is hormonal activity during gestation, it is reasonable to accept an endocrine etiologic factor in the so-called pregnancy tumor and other gum tumors. Ziskin's[6, 7] work with administration of the estrogenic hormone and subsequent proliferation of the gum tissue is further evidence of the stimulating effect of the secretions of the ductless glands upon the gingival tissues.

Ermando's[5] previously quoted statement that "the local factor by itself is insufficient to explain the epulis" might be reversed and the statement be made that general factors alone are insufficient to explain the epulis. The fact that these tumors are invariably confined to local limits and are not generalized would, in our opinion, indicate the importance of local etiologic factors.

It is our opinion that all of the previously quoted local and general factors can play a rôle in the pathogenesis of these lesions. However, we believe that malocclusion has not been fully evaluated or sufficiently appreciated as a productive factor in these lesions.

It is obvious that misdirected forces of occlusion can cause considerable trauma to the tissues surrounding malposed teeth, and initiate growth of the associated and supporting structures of the teeth. The presence of poorly alined teeth, enamel abrasion and roentgenographic evidence of alveolar resorption which accompany these tumors, if sufficiently advanced, led to this belief. Subsequent favorable response to surgical removal of the tumor tissue plus adjustment of occlusion has strengthened this contention.

TREATMENT

The method of treatment universally advocated for these tumors is surgical removal of the tumor tissue and extraction of teeth adjacent to the tumor. Irradiation with radium or the x-rays has been suggested for those that recur, but we think such a procedure unnecessary.

Appreciation and regard for the functional and esthetic value of otherwise healthy teeth, together with the favorable results obtained from treatment of periodontoclasia by occlusal adjustment, has led us[8] to treat many such cases by surgical removal of the tumor followed by occlusal adjustment of involved teeth, relieving excess stress by grinding without extraction of teeth.

Extraction is resorted to only in the following instances: 1. If recurrence takes place. 2. If malocclusion is too advanced to be corrected by grinding or

orthodontics. 3. If the loss of alveolar bone is great enough to cause the tooth or teeth to be unstable mechanically.

SUMMARY AND CONCLUSIONS

1. "Epulis," meaning a tumor of the gums, is applied only to benign tumors.

2. Histologic grouping of these tumors show them usually to be a fibroma, osteofibroma, angioma, angiofibroma or giant-cell tumor.

3. Both local and general etiologic factors must be considered in the production of these lesions, with malocclusion prominent.

4. Treatment is best accomplished by surgical removal of the tumor tissue and adjustment of the occlusion by grinding the teeth, if the case is not too far advanced. Otherwise, extraction of adjacent teeth is indicated.

REPORT OF A CASE

History.—E. L. J., a woman, aged 52, presented herself at the State Institute for the Study of Malignant Diseases, accompanied by a physician who was an old family friend. As it was impossible for the patient to speak, her history was given by the physician. Six years before admission, she noticed a small piece of gum tissue growing from the interdental papilla adjacent to a filling in the upper right first molar tooth. This gradually increased in size and seemed to be "pushing" the filling out. There was no pain, bleeding or discharge. For the past several months, the tumor had grown rapidly and had become so large that the patient was unable to take any food other than liquids. Recently, there had been some pain and bleeding. The average weight had been 169 pounds and weight on admission was 86 pounds, a loss of 83 pounds.

Examination.—A tumor filled the entire oral cavity, preventing the patient from closing her mouth. It protruded from the open mouth about 2 inches. There was protrusion and extension of the right cheek and constant drooling. The tumor appeared to originate from the upper right jaw. From the consistency, color, surface markings and texture, together with the history, a clinical diagnosis of fibroma was made. (Fig. 1.) Wassermann, Kahn and other laboratory findings were essentially negative.

Course.—The patient was informed that she would receive a general anesthetic for removal of the tumor mass on the following day. She thereupon refused treatment, would not permit a biopsy and left the hospital. As the result of urgent pleading by her family and friends, she returned to the hospital two days later. It had been planned to operate the following day, but she died on the afternoon that she had been admitted as a bed patient. Fortunately, consent to perform a necropsy was obtained.

Pathologist's Report.—The body was that of a woman of middle age, small and somewhat emaciated. The mouth was partly open and the entire mouth cavity filled with a tumor that was about 8 cm. in diameter and which caused protrusion of the right cheek. This tumor, upon investigation, was roughly nodular on the surface and was hard, white and firm. It was attached by a pedicle to the hard palate and alveolar arch on the right side of the roof of the mouth. It was removed from the mouth in sections as it was too large to come through the oral opening or between the rami of the jaws intact. Absorption of the bony structures of the maxilla and mandible on the right side was due to pressure of the tumor. There was, however, no connection of the tumor with bone. The teeth on the right maxilla and mandible were for the most part carious. The histologic diagnosis was fibroma. (Fig. 2.) Other findings were essentially negative.

COMMENT

This case illustrates the part that procrastination can play in tumor development. It was later learned that the patient had continually refused treatment because of her religious beliefs. Just what the etiologic factors were are unknown, but one or more of those previously mentioned were, no doubt, present. Had the tumor and adjacent teeth been removed early, the case would not have had a fatal termination, as the result of starvation.

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TRAUMATIZED AND FRACTURED YOUNG TEETH

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INCREASING knowledge of preventive dentistry may in time stop dental caries, but no preventive measures will ever avert the accidents that cause traumatism, fracture and, sometimes, infection of young permanent teeth. The loss of an incisor by a child is a major disaster. Careless methods of pulp protection or unskilful pulp-canal therapy can, and usually does, result in such a loss. It is not feasible to replace an incisor with a bridge, for any attachment would jeopardize the vitality of the tooth to which it was attached. To subject a young child to wearing dentures is unthinkable, provided it can be prevented.

For the purpose of this paper, traumatized young teeth may be divided into six classes (Fig. 1):

Class I, teeth that have been traumatized by some external force, but not broken.

Class II, teeth the enamel of which is broken, but the dentin not involved.

Class III, fractured teeth in which the dentin but not the pulp is involved.

Class IV, teeth in which the pulp is exposed, the exposure being minute or extensive, with laceration.

Class V, teeth that are pulpless, as the result of neglect or despite every intelligent effort to prevent loss of the pulp.

Class VI, teeth that are fractured below the cemento-enamel junction. This type of fracture usually occurs in older children, the root of the tooth being undeveloped in young children and the bone more yielding. Every traumatized tooth should be examined by the x-rays at once to determine whether it should be in Class VI.

There are various degrees of injury in each of these classifications that will require discrimination in handling.

The pathologic processes following traumatic injury to a tooth may involve the periodontal membrane, the pulp and the alveolar bone surrounding the tooth. Inflammation of the pulp is ordinarily caused by bacterial invasion from caries. This bacterial growth may extend through the apical foramen, the periodontal membrane becoming infected and inflamed. Pain may result from pulpitis or periodontitis. There is a different reaction to traumatic injury that does not expose the pulp. There is no bacterial invasion, unless it is hematogenous. The first soft tissue involved is the periodontal membrane. If the injury is not too severe and the trauma is not allowed to continue, the inflammation will soon dis-

appear, and the pulp may not be involved. If there is further trauma, the periodontitis becomes more extensive, until the pulp becomes inflamed; the pulpal congestion causes thrombosis, and the death of the pulp results. This death of the pulp is not necessarily followed by infection, but sometimes there is a drying up of the organ, and it may not become infected until caries occurs or blood-borne bacteria lodge in the canal, perhaps later in life.

An incompleted tooth with a wide open foramen cannot be completed after

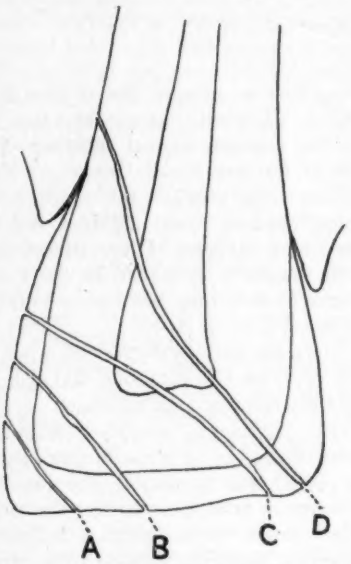


Fig. 1.—A, Fracture of enamel only. B, fracture of enamel and dentin. C, fracture involving pulp. D, fracture located partly inside and partly outside of epithelial attachment. This presents a hopeless condition.

the pulp dies, and the edges of thin dentin surrounding the foramen act as constant irritants. Osteoclasts are formed and eventually the whole root may be absorbed unless the source of the irritation is removed by careful pulp-canal therapy. Every possible effort must be made to prevent the death of the pulp. One basic rule is that continued trauma must be prevented by precluding contact with the sore tooth.

It is possible that the death of the pulp occurs more often in Class I cases because the child is not taken to the dentist and so trauma continues. The tooth is loose for a time, but as it gradually becomes tightened, the parents conclude that nothing is wrong and consequently nothing is done. The pain should be relieved, the tooth stabilized and contact prevented. The child should be fed a liquid diet for a few days. Sometimes the opposing teeth require slight grinding, and occasionally it will be necessary to raise the bite by thin metal or acrylic veneers placed over the grinding surfaces of the molars and maintained until the soreness disappears.

Stabilization may be accomplished by fitting orthodontic bands to the loose teeth and to those adjoining, with the bands soldered or wired together. The best means of stabilization is acrylic shells or veneers for the loose teeth and the adjoining firm teeth. The wax patterns for these shells may be joined and all processed as one piece, or they may be made separately, placed on the teeth and then joined after an impression is taken. It is best to do as much of the work on the model as possible so as to avoid irritation of the injured teeth.

George A. Coleman, of Philadelphia, is, I believe, the originator of the idea of the acrylic shell crown. Coleman writes of the crown and the technic of making it as follows:

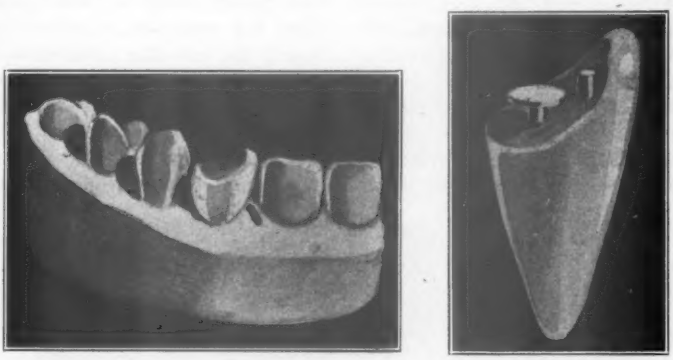
> The fabrication of acrylic shell crowns for broken incisors is very simple and it is possible to obtain esthetic effects without jeopardizing the vitality of the tooth.
>
> The technic does not require any preparation of the tooth except probably a slight disking of the incisal corner when there is an undercut. Sometimes it is necessary to make room at the gingivoproximal border. We have never found it necessary to touch the enamel on either the lingual or the labial surface even when there is a slight curvature, for there is sufficient elasticity of

the acryenamel, which is very thin, to spring over it.

A modeling compound impression is taken in a copper band, which does not fit too tightly. An electrodeposited copper model is made and a bite taken with aluwax. The die is mounted in this bite impression and models are poured.

The copper die is well oiled and the wax is applied by dipping the die in melted inlay wax until the proper thickness is obtained. It is then contoured to proper shape, and the shell wax is invested and cured the same as a regular acrylic crown. Kryptex is used for cementation because of the thinness of the crown.

Some slight modifications of Coleman's technic have been made to meet the requirements of my own operative methods. Instead of compound, I have been using one of the new colloidal materials for impressions so as to avoid thermal shock and trauma. An accurate impression can be taken at body temperature with less pressure than with compound and it can be removed with little force, provided the band does not fit too tightly. Holes should be drilled in the sides of the band to hold the material in position.



A B

Fig. 2.—A, model with broken tooth. B, model of tooth with pins to hold added stone in place.

A B

Fig. 3.—Boy aged twelve. Was seven years old at time of accident. Nothing was done in the interval. A, March 31, 1942. B, April 19, 1943.

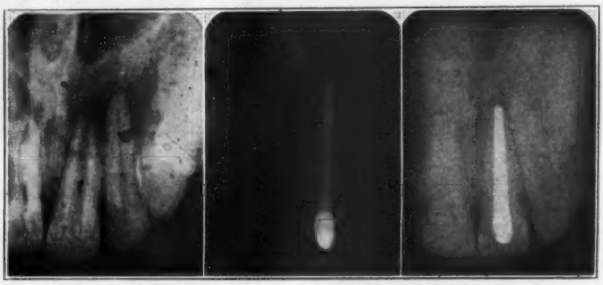
The material is packed with hard stone and the shell is built up as described by Coleman. The pattern may be removed and invested or the stone model may be invested with the wax in position. In order to make room for a bulk of protective capping over the pulp or exposed dentin in Class II, III and IV cases, we have been restoring the original shape of the broken tooth in the model. This is done by drilling holes in the portion of the model that reproduces the fracture and cementing pins in these holes. New stone is now added, the pins holding it in place. (Fig. 2.)

For esthetic reasons, it is desirable to have these shells reach to the gingiva, but it is best, in many cases, to leave a gap for making vitality tests. These tests should be made and roentgenograms

taken at frequent intervals after the shells are cemented. Before acrylic shells or orthodontic bands are cemented, the whole tooth must be thoroughly varnished, whether the dentin is exposed or not. Lefkowitz has shown that evidence of decalcification of the enamel is found under cement, and his observations indicate that varnishing the tooth is a preventive. I have used a solution of resin in chloroform for a varnish.

Class II cases may, if the fracture is slight, have the sharp edges smoothed by disks, and, unless the tooth is sore or loose, nothing further may be needed. If but little enamel is missing, the adjoining teeth can sometimes be ground so that the fracture is not noticeable. Care must be exercised to avoid grinding too much, since, in these teeth, the pulp is very large. When enough enamel is missing that grinding is not practical, an acrylic shell should be placed over the tooth.

Teeth of Class III should always be covered with a shell, after varnishing of the whole tooth. The varnish should be applied before taking the impression to afford further protection and possibly avoid forcing contaminating material into the tubules. The danger of pulpal damage, from bacteria or free phosphoric acid, is much greater after a fracture of the dentin than it is under caries because there is no opportunity for the pulp to close the tubules by the formation of a translucent area or for secondary dentin to develop, as under caries. No phenol, eugenol, camphorated phenol, formocresol, thymol or other irritating chemical should be applied to the exposed dentin since chemical trauma added to the damage already present might cause just enough additional irritation to attract a hematogenous infection, which could be fatal to the pulp. That this does not occur more often is due to the fact that bacteremia must be present before hematogenous infection can take place, but the potential danger always exists. There is always the possibility that some bacteria have reached the pulp and these strong chemicals may not destroy many, if any, but their action may inhibit or destroy the cells which would normally combat and destroy the organisms. The irritating qualities of any drug can be tested by dressing an open wound with it.



A B C

Fig. 4.—Boy aged seventeen. Accident happened several years before. A, April 18, 1940. B, June 25, 1942. This film was taken by the boy's home town dentist at a different angle. It shows complete regeneration. C, Sept. 26, 1941. Note the regeneration in 17 months.

The tooth is dried with warm, not hot, air before the varnish is applied. Much damage will follow dehydration of the tubules of freshly exposed dentin. The fractured dentin, after being varnished, should be protected with a paste of calcium phosphate and Canada balsam.[2] The use of this varnish and covering will usually control any pain due to

exposure of the dentin. While the acrylic shell is being made, the tooth may be covered with a celluloid tooth form, placed over the protecting paste. It may be necessary, in some cases, to give internal medication to control the pain caused by traumatization of the periodontal membrane. An injection of anesthetic over the apex of the tooth, which can be made without causing discomfort, will control the pain for some time. If further trauma is prevented, the pain will not recur when the effect of the anesthetic wears off.

The amount of exposure, the extent of laceration and the time since the injury will determine the method of treatment to be followed in the fourth class of cases. An attempt must always be made to preserve the vitality. If the pulp can be kept alive and the tooth allowed to complete development, the ultimate will be accomplished. If the attempt fails, the result is no more serious than it would have been had the vital pulp been extirpated, since an infected canal and periapical area can be disinfected and the canal filled with as good prospects of success as follow the removal of a vital pulp. Because this can be done, we are justified in making every effort to keep the pulp alive, even though the prognosis may be doubtful.

If the exposure is slight and too much time has not elapsed since the accident, the pulp may be capped with a paste of calcium phosphate and Canada balsam. The tooth is carefully varnished, and this paste, which is about the consistency of putty, is placed over the exposure area, without pressure. As great a bulk of capping as conditions permit is used. A piece of foil or cellophane is placed over the capping to prevent contact of the calcium salt with the phosphoric acid in the cement used to cover the capping. The impression for the acrylic shell may be taken after the capping and cement are in place. If it is taken before this, the pulp should be protected with a sterile cover of metal or other stiff material.

When the exposure is extensive or the pulp is lacerated, or if considerable time has elapsed since the accident, it is probable that pulpotomy is the operation of choice. Numerous operators have reported a growth of protective secondary dentin following pulpotomy. In some of these teeth, calcification of the pulp follows the injury when no treatment is applied. Herbert[3] states that this calcification is a "fairly common response." Many of the amputated stumps have been treated in a rather violent manner and some of them have survived. Hogeboom[4] used zinc oxide and formocresol to cover the stumps, Jordan[5] used thymol, calcium phosphate and formocresol, and McCall[6] placed eugenol, camphorated phenol and paraformaldehyde in contact with the amputated stump, although he suggested "a bland antiseptic dressing." These operators followed what may be termed "common and accepted practice." Seyler[7] sealed paraformaldehyde in the cavity for ten days to "anesthetize" the pulp before pulpotomy and states that the pulp remained alive after the operation. Easlick[8] advised paraformaldehyde for the purpose of devitalization, and many operators use it for this purpose in the form of Buckley's paste.

Kronfeld,[9] in discussing the healing processes of the tissue after the pulp was severed, said: "Aside from infection, the greatest damage to the tissue at the pulp wound can be done by the use of too powerful and harmful drugs." Asepsis has replaced antisepsis in modern surgery. Pulp canal workers have learned to avoid irritation of the periapical tissues by strong drugs, but some of those advocating pulpotomy seem to base their treatment on the hypothesis that the vital stump should be sterilized with the most potent drugs and stimulated by powerful irritants to encourage the formation of secondary dentin. The dental pulp is amply provided with various defense cells

and possesses abundant recuperative powers[2] if not inhibited by injurious chemicals.

Let us review what follows a surgically aseptic operation. The stump is covered with a sterile non-irritating capping. Tissue fluid will infiltrate and polymorphonuclear cells will begin to accumulate in and around the wounded tissue, for this is the normal reparative reaction to traumatized wounds. These white blood cells, which characterize an acute inflammatory reaction, with the assistance of other cells and antibodies dispose of the débris and overcome the low grade infection that may be present. Fibrin will form in the area, fibroblasts proliferate and scar formation begin. As a part of the healing process, the pulp will begin the formation of secondary dentin, if not too severely injured. A different reaction may take place if a strong irritating drug is placed in contact with the pulp stump. There will be an increase in round-cell infiltration, characteristic of chronic inflammation and, instead of scar tissue forming on the stump, more and more tissue will break down and chronic pulpitis will develop. This destructive reaction soon involves the whole pulp and eventually the periodontal membrane. Periodontitis develops, and unless proper pulp-canal therapy is instituted, the tooth will be lost.

Zander[10] and Restarski[11] have reported success in capping pulp stumps with calcium hydroxide paste, and Dillon[12] used effectively a paste of calcium phosphate, calcium carbonate and calcium hydroxide. He warns that arsenic may be present in the calcium salts and suggests having a sample analyzed before using. The paste of calcium phosphate and Canada balsam, previously mentioned and more fully described in another article,[2] makes an ideal capping.

Conduction, infiltration, peridental, intraosseous or general anesthesia should be used for pulp amputation. Pressure anesthesia should never be used. Hemorrhage from the stump, if too long continued, can usually be stopped by touching the stump with cotton wet with negatan. Considerable bulk of capping material is employed and the tooth is covered with an acrylic shell. The tooth should be kept under observation for several years, or until root development is complete. It is hoped that the pulp will remain vital and that root development will continue, but, although success depends, in a large measure, on the skill and carefulness of the operator, there may be a percentage of cases in which death of the stump will follow the most careful operation. The fact that death of the pulp follows a blow in many cases, when there is no fracture, looseness or soreness, should warn us not to be too optimistic.

The teeth in Class V are often considered the most hopeless. They seemed so hopeless to Brauer[13] that he advised the immediate extraction of any fractured anterior tooth the pulp of which had undergone putrescence. Bodecker[14] says, "Successful root canal therapy in a child of seven years is not simple. . . . The placing of a perfect root-canal filling in a central incisor of a child of seven years requires a very exact technique." This is undoubtedly true, but a technic can be acquired by which pulp canal fillings can approach perfection and which, if carefully followed, can be the means of saving many of these teeth for many years.

Some of these teeth are not seen by the dentist until several weeks, months or years after the accident, and then only when extensive periapical involvement is present, often accompanied by a fistula. Paradoxical as it may seem, these cases, with proper treatment, are less troublesome and can be restored to usefulness with a greater degree of certainty than is always possible in treating an exposed vital pulp, with the intention of either pulp preservation or extirpation and canal filling. Irrigation with a hot sulf-

anilamide solution makes it possible to disinfect the canal and the whole infected area. In an experience of fifty years, covering the treatment of thousands of cases, no method of treatment has ever been used by me which approaches it in effectiveness. Ionization was used for twenty-five years, and every other method and drug which seemed to promise success was tried, with more or less indifferent results. This is the only treatment ever used which has uniformly been followed by favorable results. The technic of the treatment has been described in other articles.[15, 16, 17, 18] The growth of new bone seems to follow more rapidly and with greater certainty than with any other method that I have used.

For an incompleted tooth with a wide-open foramen, it is necessary to have the canal filled so that the filling material will surround the apex and leave a non-irritating root end. If the correct technic is followed, there is a reasonable certainty that regeneration of the bone will occur and that reinfection will not take place. Although the apical area will sometimes spontaneously heal and regeneration take place without disinfection of the whole area, it does not always follow, and to assume that it will take place is to court disaster. Disinfection of the whole area should be routine practice. Two negative cultures in succession should always be obtained from both the canal and the periapical area before the canal is filled.

The technic of filling the canals of young teeth has been described in other articles.[19, 20] Some canals in young teeth are funnel-shaped in the apical third, and it is particularly difficult to get these completely sealed. It is desirable, but not always possible, and sometimes not necessary since, if complete disinfection of the canal and area is obtained, the slight unfilled gap will often become filled with connective tissue and regeneration will take place. In order for this to happen, complete sterility must be obtained, and if a bacteremia is present, there is the possibility that bacteria may localize from the blood stream and reinfection result in the area. The sides of these funnel-shaped canals may be smeared with the canal filling-paste and a silver wire or gutta-percha point of the correct size be carried into the canal, pushing the filling paste ahead of it, on beyond the apex. The point may then be withdrawn to the correct length and it will carry with it a portion of the paste, thereby filling the funnel-shaped end and leaving a deposit over the edges of the apex. I have used a filling paste made after the formula of Rickert[21, 22] for many years with excellent results.

Some of the cases in Class VI have the fracture located partly inside and partly outside the epithelial attachment (Fig. 1) and this is a hopeless condition. Healing of the broken part below the epithelial attachment is impossible, because infection will have constant access through the break. It is doubtful whether an acrylic shell can ever be fitted so as to prevent infection. Other Class VI cases, with the whole break below the epithelial attachment, should be interfered with as little as possible. The broken parts must be put in juxtaposition, as closely together as possible, and stabilized. Contact with the opposing teeth should be prevented. Kronfeld[23] said that, after traumatic fracture of the cementum, the crack was filled with tissue fluid and then fibroblasts and wandering cells grew into the tissue fluid. The fibroblasts formed a network of fibrillae and, in this way, connective tissue and cementum were built and the fracture repaired. The solid healing of the fracture is the end-result desired, but close adaptation of the parts is necessary in order to have this type of union take place. If there is some space between the parts, Kronfeld[24] asserts, fibrous tissue will remain between them and no true union take place, but this type of healing may be entirely satisfactory, provided the coronal portion is long enough

to be stable. The conditions necessary for healing of tooth fractures of this kind are the same as for ordinary bone fractures. Austin[25] in a review of forty cases, ranging in age from 12 to 63 years, concluded that accidental fracture of the anterior teeth should not necessarily condemn them to immediate extraction. Ottolengui[26, 27, 28] recorded many cases of repaired root fracture.

CONCLUSIONS

The extraction of traumatized young teeth is seldom necessary.

Early stabilization and pulp protection will often prevent the death of the pulp.

Exposed pulps may often be kept alive by capping with a sterile non-irritating and non-conductive material.

Pulpotomy will preserve the vitality of many teeth if the use of strong chemicals is avoided.

If the pulp dies, after every effort has been made to save it, the canal and infected area can be disinfected and the canal filled, with prospects of success.

The most careful and painstaking methods must be used for either pulp preservation or pulp canal therapy.

A vital pulp should seldom be extirpated from a traumatized young tooth. Every effort must be made to keep it alive, and only after it dies should pulp-canal therapy be instituted.

Fractured roots will often unite if stabilized.

Acrylic shells, as devised by Coleman, are the best means of protection or stabilization for traumatized or fractured young teeth.

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55 West Forty-Second Street.

PIGMENTATION OF DENTAL PLASTICS

V. G. Rich, D.D.S., Fullerton, Calif.

THE use of plastics in operative dentistry is an established practice. It is probable that it will become more generally accepted with the development of stronger and harder plastic materials. Much of this restorative work has a very pleasing esthetic effect. However, many careful operators are having difficulty in obtaining satisfactory color duplications. The following technic is designed to help these men to obtain the desired results.

Without going far into the theory of color harmony, two factors must be mentioned. One is correctness of the color base, in relation to the spectrum. The common colors observed in teeth include gray, tan, cream, lemon-yellow, orange-brown and brown. These are modified with white, blue, green or pink. Any of these may be mixed or blended to reproduce natural surroundings, but the correct basic colors must be used. For instance, if a lemon-yellow dominates the natural teeth, a lemon-yellow basic color must be used. If cream or tan is the basic color, cream or tan must be used; but the proper color base is the necessary starting point. Then, slight modifications may be added to produce the exact duplication. The newer porcelains, with their pinkish undertone and increased translucency, teach us the value of these qualities in plastics. A pinkish undertone is very desirable at times, but caution is necessary. There are mouths in which any trace of pink is to be avoided.

The other factor is the amount or intensity of color. This may be explained by saying that the same pigment may be mixed in varying proportions with clear plastic to produce many degrees of translucency. The effects are different, even with the same color bases. Both of these factors must be harmonized with the natural surroundings to produce accurate and pleasing color duplication.

The materials used in this technic are:

1. Fine-grained plastic. This is obtained by sifting clear denture acrylic powder through an 80-mesh wire screen. The use of this powder will give such a fine-grained effect in the finished restoration that the granules cannot be seen. Some of the commercial denture acrylics will go through this screen up to 25 per cent by volume. The coarser residue can be used for denture bases.

2. Liquid monomer (any pure acrylic monomer).

3. Pigments. Dental cement powders and porcelain stains. These may be purchased in a wide variety of tooth shades and blending shades also. They were designed by their manufacturers to reproduce natural tooth colors, and they serve excellently for that purpose when mixed with acrylic powder.

Aside from the ordinary equipment which is found in a dental laboratory, the special equipment necessary is:

1. Pressing flasks and spring press. Ordinary lock washers can be used to produce the constant pressure.

2. Clean mortar and pestle.

3. Small porcelain jars with screw tops, about 1 inch across on the inside.

4. Measuring devices such as a one-quarter teaspoon measure for acrylic powder, eye dropper for monomer and a hollow-ended cement powder carrier, such as is used for measuring cement or silicate powder.

5. Sifting screen of 80-mesh screen wire. This may be folded over a small box and the sides turned up, to make a sifting tray for the acrylic powder.

TECHNIC

The first task is to make a shade guide. This is not difficult, but must be carefully done, because it is the basis of all future results. Each specimen must be carefully numbered and its contents accurately tabulated. The lower half of a regular denture flask is filled with artificial stone, into which are carefully set several small pieces of baseplate wax, about one-quarter by one-half inch, set one-half inch or more apart. A smooth sheet of heavy tinfoil is laid over this half of the flask and the other half filled with stone. The halves of the flask are separated and the wax pieces and tinfoil, the unfoiled half, are removed. This mold is now ready to cure a large number of shades. If carefully handled and retinfoiled after each processing, this mold can be used many times.

MIXING THE PLASTIC

One-quarter teaspoonful of sifted clear acrylic powder is placed in the mortar. One-half of a portion of cement powder from the smaller end of the cement powder measuring stick is measured out. The acrylic powder and cement powder together are thoroughly triturated. A few drops (25 to 30) of acrylic monomer is placed in a small porcelain or glass jar. The powder is poured into the liquid until a glossy surface remains after jiggling the jar, making the mix as thick as possible. This is stirred slowly with a round toothpick and the jar is covered and set aside. This fine-grained powder sets quickly. When it has reached the consistency of dough, it is placed in the flask, pressed and placed in a large pan of water. The water is slowly brought to a boil and allowed to cool slowly. The halves of the flask are separated. Several specimens may be mixed and pressed in one curing operation. The color blanks are removed and trimmed, numbered and placed on a wire, after a small hole has been drilled near the end of each.

After the basic colors are used, several combinations may be made. However, for combinations, instead of using one-half a measure of cement powder each, one-fourth a measure of each is used, so that not more than one-half measure of cement powder is employed to one-fourth teaspoonful of acrylic powder. This assures about the correct opacity for dentin.

Having produced a shade guide of about twenty-five to thirty representative tooth shades and several blending shades, we are ready to match a natural case. The shadeguide is carried to the patient's mouth and the nearest colors selected for enamel and dentin and any special markings. If no shade guide color exactly reproduces the color of the tooth, the color may be modified by adding small amounts of another color, until an exact reproduction is obtained. Different colors and color brilliancies should be selected for the enamel and dentin. With each practical case, it is wise to press a specimen for the shade guide, keeping an accurate record of the proportions used. In a short time, we will have a reliable shade guide, from which we can reproduce the most difficult color combinations with accuracy.

After making a shade guide, the making of inlays, jacket crowns or pontics is merely a matter of blending shade-guide colors and using any of the recognized technics for curing.

One of the chief reasons for using pigments instead of dyes is the large range of basic colors to be had in dental cements and porcelain stains. Another reason is that, while the pigmented plastic is still in the uncured state, its final color may be closely judged, since curing has no effect on the color of the pigments. Another is that future plastics

may be adapted to this system without adjustments. Following are some suggestions regarding the production of plastic restorations:

A direct wax pattern may be taken in the mouth or carved on a model, by the indirect method. This pattern is carefully removed. The entire cavity side is covered with dental cement, which is carefully pushed or flowed on to avoid air bubbles. The cement provides a dense strong model, against which the restoration may be pressed and cured without any separating solution or foil. The outside of the restoration medium is foiled, as in any recognized technic. After it is cured and removed from the flask, it is placed, with cement core still in place, in hot dilute hydrochloric acid. The cement will soon dissolve. The acid is allowed to cool before handling the restoration medium to avoid distortion from handling. If the indirect technic is used, the plastic restoration medium is removed from the hot acid and pressed to place on the die while still hot. This technic produces a plastic restoration which is just as accurate as the wax pattern from which it was formed. It is much closer fitting than one produced either with a foiling technic or a separating medium method, because no separating medium is interposed between the die and the restoration medium.

In applying one shade over another, the bulkier part is pressed while cold, as in trial packing, cellophane being used between the halves of the flask. All excess is trimmed off and, with fine pointed scissors, room is made for the overlying shades at the incisal or gingival borders. The cut surface is wet with a drop of monomer liquid. The overlying shade is applied in just about the amount needed, excess being avoided. With a round toothpick dipped in monomer liquid, the edge of the overlying color is worked into the base color so that there will be no line of demarcation.

In choosing the enamel shade, desirable results may often be had by using the basic dentin color diluted with more clear plastic. This decreases the color saturation, making an incisal edge of the same basic color as the body of the restoration medium, except for a greater transparency.

DENTURE BASE PINK

Denture base pink may be modified with pigments whenever the color of the mucosa differs from the standard pink. To deepen the redness, small amounts of cadmium red or imported red iron oxide may be added, the iron oxide being slightly brownish. These are very powerful pigments, and the addition of even small amounts, such as a particle 2 mm. across, will produce a perceptible change on trituration with a regular batch of pink plastic. The slightly granular effect which appears when this powder is used with unscreened pink powder is quite pleasing.

The use of pigments as coloring material in plastic restorations has given more accurate color duplication than has heretofore been obtainable in my office. Also the use of cement cores or models without separating media produces a really accurate adaptation. This article assumes that the reader has acquainted himself with the fundamentals of handling plastics and has therefore eliminated much of the detail.

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FEBRUARY 1 *Editorial Department* 1944

DENTAL RADIOLOGY

IT has long been recognized that the x-rays as an aid to diagnosis of oral diseases have contributed materially to the development of practically every phase of the practice of dentistry, but it was not until the recent meeting of the House of Delegates of the American Dental Association at Cincinnati that radiology *per se* was officially recognized by the Association.

At the Cincinnati meeting of the Board of Trustees, Dr. Leroy M. Ennis, of Philadelphia, on behalf of a group of dentists interested in the application of radiology to dental practice, presented the following resolution:

"At a meeting of Dental Radiologists held in the Netherland Plaza Hotel, Monday evening, October 11, 1943, the feeling was expressed that the field of Dental Radiology was of vital importance to the practice of dentistry, and that a Section on Dental Radiology be created and placed on the program of all future meetings of the American Dental Association."

This resolution was favorably received by the Board, recommended to the House of Delegates and unanimously adopted.

Accordingly, there was established a section on Dental Radiology, which will devote its efforts to the development of this valuable adjunct to the diagnostic armamentarium of the dental operator. It will also be the purpose of this section to extend our knowledge of radiology into the various phases of dental practice.

Without doubt the greatest value of the roentgen-rays to dentistry has been their use as a "seeing eye" to direct and confirm the results of efforts to save the pulpless tooth through instrumentation and filling of the root canals after removal of the pulp.

Among the earliest problems of dentistry on the very threshold of the development of dentistry as a scientific profession was the salvability of the tooth in which the pulp had been destroyed, through whatever means, as a unit in the masticatory apparatus. And it was the effort to devise and perfect an operative technic that would warrant allowing the pulpless tooth to remain in the mouth that gave rise to the age-old discussion as to whether or not a tooth from which the pulp had been removed and the root-canals filled was a menace to the health of the patient. Innumerable teeth were so treated by innumerable methods and many teeth were saved and many were lost, but the losses were gracefully accepted as the hazards of dental practice without much serious consideration.

The introduction of bridgework into dental practice as a means of deferring the day of the artificial denture directed serious and profession-wide attention to the pulpless tooth and its retention as a means of anchorage of the crown and bridge.

From the very beginning of what we may designate as the bridgework era, it was recognized that the value and life of the bridge were dependent upon the success of the efforts to remove the pulps and fill the canals of the teeth that were used as anchorage for the bridge. This recognition, along with the loss of teeth used for anchorage and necessarily the bridge apparatus in most instances, impelled more serious attention to the pulpless tooth and means for saving it.

Various methods were devised and applied and with varying degrees of success. The *sine qua non* of root canal filling was soon recognized to be the complete and successful removal of the pulp and its replacement by substitute materials. And there were those who claimed complete success for their method, the only criterion for success being the retention of the tooth in an apparently healthy condition. The operators could not successfully defend the charge that the roots were not success-

fully filled, nor could the doubting Thomases confirm the charge of incomplete filling. Then came the x-rays, to show the way, as it were, and they were soon developed as a definite aid to dental operative procedure and as a disillusionment regarding beliefs and statements about root canal fillings. And today the success of the root canal operation is dependent entirely upon the use of the x-rays as a guide and director of the filling technic and in follow-up procedures to determine the permanency of the operation.

The use of the x-rays and other light rays in various other phases of dentistry has contributed much to the usefulness of dentistry as a health service. In orthodontia the use of the x-rays has been invaluable as a diagnostic aid. In the effort to control caries, the x-rays have opened the way for discovery of the caries process long before it is evident to ordinary examination procedures. In periodontia the aid from the x-ray has not only enabled the operator to proceed in a much more intelligent manner in the treatment of periodontoclasia, but the use of the x-rays and other rays for their therapeutic value has forwarded materially the successful treatment of this bugbear of the human race.

In prosthodontia its notable contribution has been to enable the operator to determine the presence of fractured roots from teeth that have been extracted, thus interfering with the restorative efforts of the prosthodontist.

In exodontia its influence made possible the development of a technic in the removal of the impacted molar by the late Dr. George B. Winter that constitutes a definite scientific advance in exodontia. In the field of preventive dentistry, we are greatly encouraged to believe that the x-ray will contribute notably to this phase of practice in its helpful aid toward the prevention of the death of the pulp.

In fact, radiology has made itself so unexpendable in the various phases of dental practice, particularly in the diagnostic field, that the dentist who is not availing himself of its aid and benefit is not fulfilling his professional obligation to his clientele.

On the other hand, dentistry has materially contributed to the development of radiology in its application to medical practice on the whole.

Notable among the pioneers in the development of the knowledge of the x-rays have been a number of dentists and their contribution to the study of the x-rays through the period when little was known of their helpful, as well as harmful, effects, to the point in several instances of tragic consequences. To mention only a single instance—our own be-

loved and esteemed Edmund C. Kells gave of his effort in the development of the x-rays to the extent that he practically sacrificed his life to the study of their uses and properties.

There have been many important developments in dentistry that have exerted most beneficial influences on our methods of procedure, but none has left a more profound impression upon so many phases of dental practice as has the radiographic process.

While the revelations of the x-ray have been such as to frighten dentistry into a hysteria of ruthless extraction of teeth, its benefits as an aid in developing the biologic conception of dental practice have been inestimable. And while its revelations and disclosures in faulty crown and bridgework came near to being calamitous, its influence on the whole has been conspicuously toward the wholesome development of dentistry as a most important aid to bodily health.

So that, it is most fitting and appropriate that a Section on Radiology be established in the American Dental Association, not only because of the many benefits that it has already brought to dentistry, but also because of the promise of further benefits through the development of its therapeutic relationships to mouth health service.

INDEX FOR 1943

THE Index for Volume 30, 1943, will be published this year separately from THE JOURNAL and will be supplied without cost to all members of the Association upon request.

The Index is being published in this manner in an effort to aid the Government in the conservation of paper.

We urge all who wish copies of the Index to send in their requests promptly.

BIBLIOGRAPHICAL

Psychosomatic Medicine.

By Edward Weiss and O. Spurgeon English. 651 pages. Price $10. Philadelphia: W. B. Saunders Company, 1943.

Parts of this book are of more than general interest to the dentist. In the first chapter, the authors explain the meaning of psychosomatic medicine. "The day is near at hand for the final outmoding of the 'either-or' concept (either functional or organic) in diagnosis and to place in its stead the idea of how much of one and how much of the other, that is, how much of the problem is emotional and how much is physical. This is truly the psychosomatic concept in medicine."

The section devoted specifically to dentistry is found in the second part of the book, which points out that "all medicine is psychosomatic medicine." Weiss and English open the discussion of dentistry by stating that the fear of being hurt and the fear of the loss of teeth keep people away from the dentist. Losing the teeth has not only the more obvious significance, but is associated with the idea that wearing a denture is a sign of old age. This emotional factor is present in men as well as in women. The authors state that, for this reason, many "chronic illnesses of psychosomatic origin can be traced to a dental operation, the fitting of dentures, and the failure to adjust to them." In discussing children's dentistry, they sum up facts about the first visit, the way to present the idea of dentistry to the child, and the mother who hovers over the chair, which are known to all who are interested in children's dentistry. An interesting idea is presented when dentistry is considered as another form of surgery. The same people, severe psychoneurotics, who "are addicted to polysurgery," actually may enjoy having operations performed on their teeth and gums. These people, fearing "foci of infection" and resultant grave systemic disease, have powerful subconscious impulses at work. These emotional factors make the individual persistently illogical and insistent upon some form of surgery. Atypical facial neuralgia, caused by "focal conflict" rather than by foci of infection, and treated by finding and correcting the life situation, are mentioned. Dentistry, then, does not differ from other fields of medicine from the point of view of the writers as evidenced by their concluding statement: "Therefore the removal of teeth may have a significance far beyond the superficial, purely mechanical ideas that are usually entertained when we speak of dental extractions. The teeth can be no more divorced from the personality of the patient, so far as psychosomatic medicine is concerned, than any other part of the body."

This is a thought-provoking book for the dentist. Many challenging ideas, both old and new, have at length been brought together and given verbal expression.

W. F. Barnfield.

Acrylic Resins in Dentistry.

By John Osborne, L.D.S. (Birm.). Whole-Time Lecturer and Demonstrator in Dental Prosthetics, University of Sheffield; Assistant Honorary Dental Surgeon, Royal Sheffield Infirmary and Hospital. Author of "Dental Mechanics for Students." 94 pages; 55 illustrations. Price 8/6 net. Oxford: Blackwell Scientific Publications, Ltd. 1943.

From Great Britain in these war times comes this concise and informative little book dealing with acrylic resins. The author says, in his preface: "It has required the stimulus of war to induce the majority of the dental profession to use a denture base possessing satisfactory aesthetic and physical properties. Without the exigencies of war these new materials would most certainly have forced their way, ultimately, to the prosthetic 'first line,' but it is doubtful if they would have secured such a position in so short a time had not restrictions in rubber supplies been made necessary by the development of the war in the Far East."

The author has prepared this summary on

the use of acrylic resins in dentistry to supply information to those dentists who have been forced to use these materials without previous instruction. He traces the progress of plastics in dentistry, and discusses the subject of practical manipulation of acrylic resins. All the stages of flasking, packing and deflasking are extensively illustrated. The book concludes with descriptions of technics for tooth, inlay and crown construction.

Brief discussions of scientific investigations of the acrylic resins are included, but emphasis is placed on the technics for the use of plastics. Most of the text material is well known in this country, but the book will serve as an excellent introduction of the plastics to the dentist and dental student.

The value of the book is reduced somewhat for readers in the United States because certain of the commercial products discussed are not sold in this country.

The book is indexed and a good bibliography is added to each chapter. It conforms to England's "Book Production War Economy Standard."

M. K. H.

Personal and Community Health.

By C. E. TURNER, A.M., Sc.D., Dr.P.H. Professor of Public Health in the Massachusetts Institute of Technology; Formerly Associate Professor of Hygiene in the Tufts College Medical and Dental Schools; Sometime Member of the Administrative Board in the School of Public Health of Harvard University and the Massachusetts Institute of Technology. Seventh Edition. 585 pages. Illustrated. Price, $3.50. St. Louis: C. V. Mosby Company, 1943.

BECAUSE of the new health problems that face this country, health education is assuming definite importance. This book by C. E. Turner is designed to be used as a textbook for health instruction to students of the various college level groups. It presents the essential present-day knowledge of personal and community health in a style understandable to the layman.

The text is concerned with four primary topics: the normal functioning of the body, the hygienic conduct of daily life, the avoidance of diseases which arise from some constitutional disease and a discussion of the environmental or communicable diseases. In the appendix are given outlines of methods of diagnosing and controlling more than sixty communicable diseases, methods of disinfection, a table of prefixes, suffixes and combining forms and a glossary of about 350 terms.

The book should be made required reading for college students, and should prove of value to dental students and dentists, particularly those interested in community health.

M. K. H.

Textbook of Physiology

By WILLIAM D. ZOETHOUT, Ph.D., Professor of Physiology in the Chicago College of Dental Surgery (Loyola University), and W. W. TUTTLE, Ph.D., Professor of Physiology, College of Medicine, State University of Iowa. Eighth edition, with 728 pages, 308 illustrations, 3 color plates and 37 tables. Price $4.75. St. Louis: C. V. Mosby Company, 1943.

THIS physiology textbook is designed for use in dental, pharmacy and liberal arts colleges where a comprehensive, detailed book is not desired. The authors have limited the material presented so that the book should serve as a textbook in a course which requires fifty to 150 hours.

This revised edition is simply and lucidly written, and has been brought up-to-date. For instance, ten vitamins are briefly discussed, and the authors even consider the effect of fluorine on the incidence of dental caries.

The book opens with a description of protoplasm and life processes, and considers enzymes, control of tissue activities, nerve and muscle physiology, blood, heat vasomotor control, proteins, carbohydrates, fat metabolism, etc. Any one studying this text will get a modern concept of physiology. A glossary of terms and an adequate list of bibliographic references are included.

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A Message from the President

THE FOURTH WAR LOAN DRIVE

THE Treasury Department of the United States has embarked upon its Fourth War Loan Drive, and appeals to the American Dental Association for support and leadership in this line of defense for our country at war.

All of us, whether in civilian practice on the home front, or in dental practice in the armed forces, should enthusiastically invest in our own government in order to preserve it and to make it secure. In this drive, the participation works two ways: security for the Nation, and financial security for our own future. Our government does not ask us to give: it only asks us to lend our money.

As President of the American Dental Association, I ask that, in this crucial, and possibly decisive, year, the members of the dental profession lend to Uncle Sam the greatest amount of money that they have yet lent. It is not necessary for me to appeal to you through emotion or patriotism. You are intelligent, practical, scientific men and women, interested in America and our way of life. You wish to see all that we have worked and striven for preserved, that our nation may continue in leadership and as the humanitarian country that it is.

To preserve the house that we have built and cherished, we must maintain and defend it. In the year ahead, these two precepts must be borne in mind, and we must cheerfully and willingly give support if we are to maintain and defend. As leaders in civic, community and professional life, let us set an example by leading in this great war effort. Let us lend, then, to the fullest extent of our ability. For your guidance, based on surveys, we assume that you will be buying at least $50 worth of bonds per month during 1944. (Many will be buying more.) Therefore, during January and February, the total period covered by the Fourth War Loan Drive, you would be buying at least $100 worth of war bonds. Now, the Treasury Department asks every American to buy at least an extra $100 war bond over and above regular purchases. On this basis, the minimum quota from every dentist in the United States would be $200 worth of bonds during the Fourth War Loan Drive. I suggest this as a minimum. Those who can lend more should not be limited by this minimum quota.

It is hoped that you will support this drive so that our democratic way of life may be preserved; that the war may be won, and that our men may come home again to the security and protection of the greatest of all institutions, our home—the American home.

C. RAYMOND WELLS, *President,*
American Dental Association.

WAR SERVICE COMMITTEE

THE WAR LOAN DRIVE

JANUARY 18 TO FEBRUARY 15

To Presidents and Secretaries of State Dental Societies and Editors of Dental Journals:

The American Dental Association, through communications received from the Treasury Department by the President, C. Raymond Wells, and the chairman of the War Service Committee, has been requested to participate actively in the forthcoming War Loan Drive, January 18 to February 15, 1944. The Treasury Department has issued the enclosed suggestions.

Dr. Wells is issuing an appeal to the profession, presented herewith, in which he urges that all state and local societies adopt intensive programs in furtherance of the drive. These should have the effect of interesting practically all dentists in the movement.

The question of quotas is a difficult one, but with the assistance of the Committee on Economics, the accompanying quotas have been tentatively set, the breakdown being by states, based upon the numbers of dentists estimated to be practicing therein in 1943 multiplied by $200 to cover the assumed regular purchase of $100 worth of bonds, plus $100 for the purchase of an additional bond. Therefore, during January and February, the total period covered by the Fourth War Loan Drive, each would be buying at least $100 worth of war bonds. Now, the Treasury Department asks every American to buy at least an extra $100 war bond over and above regular purchases. On this basis, the minimum quota from every dentist in the United States would be $200 worth of bonds during the Fourth War Loan Drive. These figures are not arbitrary and are sent to you as marks at which to shoot in the forthcoming drive. They may even be impossible to approach in certain sections, but every effort should be made to do all possible.

As Dr. Wells has stated, it is urgent that dentists on the home front especially, and in the armed forces, lend their money now to the government in its time of need. From all indications and reports, the crucial hour has arrived! Therefore, the committee urges the profession to sacrifice by lending even more than it has in the past, so that, as far as the dental profession is concerned, the Fourth War Loan Drive will be an outstanding success, serving notice to the men on the fighting fronts, and to our enemies, that dentistry is doing everything possible to insure victory.

As requested by the Treasury Department, all returns should be made to the local War Bond Committees, but it will be appreciated if the total amounts subscribed are reported to this committee.

C. WILLARD CAMALIER,
Chairman.

PROPOSED PLAN FOR FOURTH WAR LOAN DRIVE

1. That the American Dental Association issue an appeal to all local or county dental associations, urging them to set up Fourth War Loan Bond committees.

2. That the committee appoint certain dentists in each locality to solicit their fellow-members for war bond purchases.

3. That every solicitor have definite names assigned to him. (In other instances, the number of names has been limited to ten.)

4. That the whole system be governed by quotas.

5. That the American Dental Association suggest the quotas by adopting a national quota figure based on the total income of dentists of the United States.

6. That the American Dental Association break this down into chapter quotas, subject to the latter's acceptance.

7. That the local chapters estimate the incomes of their members, taking into consideration personal and local conditions. By adding these together, quotas may be established for their chapters.

8. That these local quotas be reconciled with those suggested by the American Dental Association national headquarters.

9. That the total of all local quotas finally adopted constitute the national quota which will be accepted by the American Dental Association as its goal.

10. That the local committees, as soon as appointed, obtain the assistance of the Treasury local war bond committees.

11. That records of all sales be turned in through these committees.

WALTER H. WUERDEMAN, *Chief,*
Business and Trade Association Section,
War Finance Division.

In connection with the forthcoming Fourth War Loan drive, the War Service Committee requests all of the War Loan Committees of the state and local

STATE QUOTAS FOR DENTISTS
FOURTH WAR LOAN DRIVE
JANUARY 18—FEBRUARY 15, 1944
(Including regular and extra purchases)

	Civilian Dentists 1943	Dentists' Quota
NATIONAL	$60,496	$12,099,200
Alabama	505	101,000
Arizona	108	21,600
Arkansas	326	65,200
California	4,909	981,800
Colorado	625	125,000
Connecticut	982	196,400
Delaware	89	17,800
District of Columbia	567	113,400
Florida	644	128,800
Georgia	720	144,000
Idaho	202	40,400
Illinois	4,593	918,600
Indiana	1,596	319,200
Iowa	1,787	357,400
Kansas	843	168,600
Kentucky	758	151,600
Louisiana	741	148,200
Maine	351	70,200
Maryland	686	137,200
Massachusetts	2,653	530,600
Michigan	2,570	514,000
Minnesota	1,628	325,600
Mississippi	293	58,600
Missouri	2,172	434,400
Montana	253	50,600
Nebraska	739	147,800
Nevada	51	10,200
New Hampshire	200	40,000
New Jersey	2,325	465,000
New Mexico	96	19,200
New York	7,894	1,578,800
North Carolina	708	141,600
North Dakota	224	44,800
Ohio	3,438	687,600
Oklahoma	608	121,600
Oregon	662	132,400
Pennsylvania	5,414	1,082,800
Rhode Island	365	73,000
South Carolina	310	62,000
South Dakota	255	51,000
Tennessee	848	169,600
Texas	1,064	212,800
Utah	248	49,600
Vermont	115	23,000
Virginia	755	151,000
Washington	1,005	201,000
West Virginia	515	103,000
Wisconsin	1,950	390,000
Wyoming	106	21,200

"LET'S ALL BACK THE ATTACK!"

dental societies to obtain from the United States Treasury. County War Finance committees appropriate literature to be used by solicitors, including solicitors' manuals, list of securities available, etc.

War Service Committee,
C. WILLARD CAMALIER,
Chairman.

WAR SERVICE COMMITTEE MEETING

TENTATIVE program of the session of the War Service Committee, to be held in the Crystal Room of the Palmer House, Chicago, Ill., Saturday, February 19, 1944, beginning at 9:30 a.m.:

9:30 a.m. Address by Capt. C. Raymond Wells (DC) USNR, President, American Dental Association.

10:00 a.m. "Dental Education in War and Post-War Eras." (Speaker to be announced.)

11:00 a.m. "Civilian Health in World War I and Now." Warren F. Draper, Acting Surgeon General, U. S. Public Health Service. (The speaker will also discuss shortages of dentists and physicians in critical areas.)

LUNCHEON

1:30 p.m. Symposium on the Service Rendered by the American Dental Association, in This Crisis, to the Armed Forces and in Civilian Practice.

(The presiding officer of this symposium will be W. H. Scherer, President Elect of the American Dental Association. The forum will be participated in by the Committee on Legislation, the Special Army-Navy Committee of the American Dental Association, the Special Committee for Military Affairs, American Dental Association, the War Service Committee, representatives of the armed forces and other persons in attendance. At this session, an opportunity will be given those interested to propound questions and to receive answers, and on the basis of information received, the armed forces and committees of the Association may govern their future procedures for the alleviation of conditions complained of. Written communications will be given careful consideration.)

4:00 p.m. Symposium on "Dental Instruments, Equipment and Supplies."

(This forum will be participated in by representatives of the War Production Board, of the armed forces, dental schools, manufacturers and the Special American Dental Association Committee to Cooperate with the American Dental Trade Association and the War Service Committee. This discussion is proposed to clarify the situation with regard to shortages in certain dental equipment and supplies, and it is hoped that all dentists interested may be present to enter into the deliberations.)

The War Service Committee desires to emphasize that, while different subjects have been enumerated for this all-day session, all persons participating in the various subjects, and others interested, are cordially invited to attend the entire session.

C. WILLARD CAMALIER, *Chairman.*

BUREAU OF PUBLIC RELATIONS

DENTAL NEEDS VERSUS DENTAL MANPOWER

HENRY KLEIN,* D.D.S., Sc.D., Bethesda, Md.

THERE is evidence at hand that, on a biologic basis, dental need develops at about the same rate in the various socio-economic segments of the population.[1]

It is generally recognized, however, that persons in the higher socio-economic groups visit dentists frequently to obtain nearly all the service they require; i.e., their need and the amount of service that they receive are very nearly matched. On the other hand, persons in the general population, who may safely be assumed to develop, constitutionally at least, as much dental disease as those in the higher economic positions, do not obtain as much service as they require; and that which they obtain is often rendered too late to prevent the development of the more complicated needs which arise out of neglect.

Accordingly, the true need for dental service in the whole population can be estimated by applying to the general population the rate at which dental service is obtained by persons in the higher socio-economic groups. It is on that premise that estimates of the volume of dental need now existing, as well as that which can be expected to develop each year, in the whole population, are based in the present paper.

THE NEEDS AND THE SERVICES RECEIVED

Yearly Crop Among Adults.—The dental service needed and that received each year by the 77 million white population 20 years of age and over is estimated in Table 1. (These findings, given here in brief form, will be presented in fuller detail elsewhere. The data show that, from 20 to 65 years of age, each hundred persons whose family incomes are at least $5,000 a year receive each year approximately 100 fillings, thirty extractions, ten crowns or bridges, two plates and forty prophylaxes. On the other hand, each hundred persons of the general adult population, i.e. of any income class, although they need about as much service as the well-to-do now get, have, on the average, per year, only about thirty fillings, forty extractions, three crowns or bridges, two plates and six prophylaxes. The annual rates of dental service received by persons of the various family income groups are derived from Collins.)[2]

The white adult population receives, then, each year: less than one-third of the fillings needed, less than one-third of the crowns and bridges, about all the plates, about one-seventh of the prophylaxes and more extractions than would have been required if service had been adequate in other respects.

Yearly Crop Among Children.—It has been shown that between age 6 and age 20, white persons need, on the average (among other services), more than one filling a year.[3] Hence, for the 33,000,000 persons included in that age range, about 33,000,000 fillings are required each year. However, each year only about one of every five cavities is filled.[3] The children receive only about one-fifth of the fillings that they need; i.e., 7,000,000 of the 33,000,000 needed.

Accumulated Need Among Children

*Senior dental officer, United States Public Health Service.

From the Division of Public Health Methods, National Institute of Health.

Read before the Philadelphia County Medical Society, Philadelphia, Pa., April 30, 1943, and the Alameda County Dental Society, Oakland, Calif., June 18, 1943.

and Adults.—Obviously, because of the continuing disparity between the yearly incidence of need and the yearly incidence of service, the needs have been accumulating rather consistently over the past generation. Among adults, 20 years of age or older, the accumulated needs include, on the average (among other needs), about four fillings and more than two extractions per person.[4] The accumulated needs among persons between 6 and 20 years of age include about seven fillings per person.[3]

THE NEEDS VERSUS THE MANPOWER

In round numbers, there were, before the present war, 65,000 dentists under 65 years of age practicing in the United States. If each of those dentists were to work at the chair forty hours a week for fifty weeks a year, there would be available 2,000 hours per year per dentist, or a total of about 130,000,000 dentist-chair-hours a year. (A recent survey indicates that the dentists in practice in the District of Columbia are now spending, on the average, forty hours per week at the chair.)[5]

Table 1.—Dental Service Needed and Received Annually by 77 Million Adults

Type of Service	Annual Number (in Millions)	
	Needed	Received
Fillings	79	23
Extractions	25	28
Crowns or bridges	10	3
Plates	2	2
Prophylaxes	28	5

The need for fillings, extractions, crowns and bridges, plates and prophylaxis arising each year in the white population over 6 years of age demands just about 136,000,000 hours of dentist-time, as shown in Table 2. Hence, what actually constitutes only a part of the total yearly crop of dental needs alone requires all the dentist-time that is available. (Appropriate weighting of data from reports of the Committee on the Costs of Medical Care indicates that a filling requires about forty minutes of dentist-time; an extraction, about thirty; a crown or bridge, 100; a plate (full or partial), about 140, and a prophylaxis, sixty minutes.[6] The figures on the time required to complete particular kinds of dental service given in Table 2 for the stated populations were obtained by applying these averages to the volume of need estimated in the earlier sections of the present report.)

To that figure (136 million hours) must be added the annual dentist-time required to service children under 6 years of age; the annual need in children for services other than fillings; services such as examinations, orthodontia, extractions and oral surgical treatment; the annual need among adults for treatment of the periodontal diseases and the disorders requiring surgery, and the annual dental needs of that large group of persons who are not of the white race.

Table 2.—Dentist-Hours Required Annually to Meet Service Needs

White Population	Service	Millions of Dentist-Hours
77,000,000 adults	Fillings	53
	Extractions	13
	Crowns and bridges	16
	Plates	4
	Prophylaxes	28
33,000,000 children	Fillings	22
		136

Considered all together, it becomes reasonable to assume that the total yearly crop of dental need in the whole American population requires for its service probably at least double the present volume of dentist-manpower; that is, instead of the 65,000 dentists, at least

130,000 are required, just for yearly maintenance.

The accumulated need for the four fillings and the more than two extractions required per white adult may be estimated to require for the 77,000,000 such persons at least 200,000,000 additional dentist-hours. Furthermore, the accumulated need for fillings among the 33,000,000 persons between 6 and 20 years of age may be set at about 4.6 hours of dentist-time per person, or more than 150,000,000 dentist-hours.

Accordingly, the accumulated need for fillings and extractions among adults and the accumulated need for fillings among children considered alone would require about 350,000,000 dentist-hours; that is, the full time of almost three times as many dentists as we now have, working for one full year.

The needs now accumulated, plus those to be expected within a year, require, therefore (in order to clear up the whole need within one year), more than 600,000,000 dentist-hours, or about five times as much dentist-time as we now have. (Estimates of the costs [in dollars] are not given here. However, simple multiplication of the dental-hours here estimated by dentists' charges per hour provides a rough estimate of cost.) It follows that, with available dentists' work-capacities, the load of need with which they are confronted makes the phenomenon "accumulation of dental need" predictable and inevitable.

The basic cause of such accumulation has existed for some time; a situation in which there is too much dental need and not enough dentist-time to meet it.

IMPLICATIONS

These estimates of the dental manpower required to meet the dental need have been developed and dealt with here largely for the purpose of demonstrating: (a) the tremendous volume of need which arises each year in the American population; (b) the existing disparity between the yearly incidence of need and service; (c) the result of that continuing disparity, accumulation of need, and (d) the basic causes of that disparity, a shortage of dental manpower and, more important, of knowledge as to how the yearly incidence of dental disease can be reduced.

Should we attempt to take care of the mass of dental need in the whole population by increasing our present dental manpower fivefold? In terms of the estimates given above, nearly 260,000 full-time dentists would be needed to work with the 65,000 we now have under 65 years of age if the problem of accumulations and this year's crop of need were to be resolved within one year. The training of that many dentists would require several generations.

Obviously, such an increase at this time is not warranted. Demand and, more important, support for it does not exist. Furthermore, such an increase is not only impossible, but also inconsistent with the true nature of the problem since, after the fivefold increase of dentists had worked for one full year, all accumulation of need would have been cleared up. We would then have, in the following year, more than twice as many dentists as we would require for current servicing of the yearly crop of need in the whole population, which would at that point be free from accumulations.

Should we then attempt to take care of only the yearly crop of need in the whole population by increasing our present dental manpower to only twice its present strength? To answer "Yes" would require a doubling of the training capacity of the available dental schools, and it would take more than a generation to provide the required number of dentists.

If such an expansion of dental manpower were to be decided upon, it would have to be related to and reconciled with the realities of the American scene.

Many associated adjustments would need to be made before or coincident with such an increase. Otherwise, the expansion could not be justified, or even supported. Those adjustments involve both materiel and personnel: the methods of training dentists, the technic of providing and dispensing dental care and the cost of such care and the volume of demand for it.

Such objectives are somewhat distant and surely difficult to achieve. What are the objectives that may be more immediately attained?

The estimates and discussion given here serve to disclose two rational approaches to the problem that are possible at this time; and the more nearly simultaneously they are implemented, the more mutually complementary will they become. Those two approaches are: (a) the servicing of dental need as it arises year after year, in children of the growing generation[7] (an approach to the problem that has been briefly mentioned by Neumann[8] and by Simons and Sinai,[9] who report a discussion by Grandison[10] on that subject) through the expansion or transfer of dental manpower for that specific purpose, and (b) the continuance and enhancement of fundamental, clinical and epidemiologic research for the purpose of learning how the capacities of the present available dental manpower to render therapeutic services can be increased, and how the incidence of dental disease in the whole population can be decreased.

SUMMARY

It has been the main purpose of the present paper to describe, in reasonably quantitative terms, the amount of accrued dental need now existing in the American population and the amount which, on a biologic basis, can be expected to arise each year under prevailing circumstances.

It is shown that present dental manpower is not sufficient to meet the accrued needs or even the crop which arises each year.

It is pointed out that, in practical terms, the only solution of the problem that can be discerned at this time requires a concentration of effort and dental manpower on the systematic serving of the yearly need as it arises in the new generation of children, and the continuance and expansion of basic research aimed at reducing the yearly crop of need *per se*.

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DENTAL HEALTH WEEK IN KANSAS

PROCLAMATION

Executive Department,
Topeka, Kan.

To the People of Kansas, Greetings:

PHYSICAL fitness in the teen-age boys and girls soon to be absorbed into military and industrial services in the war effort is a national objective. Dental defects rank first as a cause for lowering the physical status of the youth examined for military service. Dental diseases also cause much absenteeism in war industries.

In recognition of this condition, the United States Office of Education, the United States Public Health Service and the American Dental Association are jointly sponsoring a nation-wide program designed "to make boys and girls approaching military and employment age, dentally fit to fulfil their responsibilities in the war effort."

In Kansas, this program will be initiated through the united efforts of state education, public health, dental and other organizations under the general direction of the Division of Dental Hygiene of the Kansas State Board of Health.

Therefore, to emphasize its importance and to aid in launching this program in high schools of this state, I, Andrew F. Schoeppel, Governor of Kansas, now do proclaim the week beginning January 10, 1944 to be "High School Physical Fitness Dental Health Week" and urge pupils, parents and all other interested groups to cooperate, during this and the following weeks, in attaining the goal set forth in this program.

Done at the Capitol in Topeka, under the Great Seal of the State this 18th day of November, A.D., 1943.

ANDREW F. SCHOEPPEL,
Governor.

"The JAPS are TOUGH but—
TOOTHACHE IS TOUGHER"
Have... DENTAL DEFECTS Corrected Now
KANSAS STATE BOARD OF HEALTH
DENTAL DIVISION

New and attractive 3 color 11½ by 14 inch poster developed by Kansas State Health Department in the state high school Victory Corps Physical Fitness Dental Program.

KANSAS CITY, MO., SCHOOL AUTHORITIES EXCUSE CHILDREN FOR NECESSARY DENTAL SERVICE DURING SCHOOL HOURS

THE Kansas City, Mo., Board of Education is to be congratulated upon the fact that it is one of the first boards of education in the country to permit pupils to visit the dentist during school hours. The Kansas City School Handbook contains the following notice:

"Authorization of the cooperation of building principals in the matter of excusing pupils for necessary dental work

during the school day, when requested by the dentist and by one of the parents, through the utilization of the dental excuse blank, was granted by the Board of Education last year and will be continued again during the 1943-1944 school year. Cooperation of all members of the dental society in keeping the number of pupils for whom dismissal is requested to a minimum has been assured, while, if the hour designated for excusing is not acceptable to the pupil's schedule, the time may be altered by calling the dentist. This procedure is in the interest of pupil health and is made necessary by the war emergency."

EXCUSE FORM FOR DENTAL APPOINTMENT

Approved by Public School Authorities of Kansas City, Missouri

Name of Pupil_____

has an appointment for necessary dental service on

Date of Appointment_____ 19____

Time of Appointment_____.

This service cannot be satisfactorily rendered outside of school hours.

_____ D.D.S.

This appointment was arranged with my knowledge and approval.

_____

Signature of parent

THE excuse form shown above, used judiciously, enables the Kansas City, Mo., children to obtain necessary dental service that cannot be satisfactorily rendered outside of school hours.

FOURTH ANNUAL CHILDREN'S DENTAL HEALTH DAY of the CLEVELAND DENTAL SOCIETY

February 7, 1944 Hotel Carter

TENTATIVE PROGRAM

9:00 a.m. BASIL G. BIBBY, D.D.S., Boston, Mass.: "Fluorides and Clinical Dentistry."

10:00 a.m. CAPT. C. RAYMOND WELLS (DC), USNR, President, American Dental Association: "The Nation—The Child—YOU."

11:00 a.m. JAMES A. HARTMAN, D.D.S., Cincinnati, Ohio: "What I Do for Children in My Practice."

12:15 p.m. Luncheon. Presentation of distinguished guests. Speaker: RUSSELL W. BUNTING, D.D.S., Ann Arbor, Mich.: "Present Trends in Dentistry."
Acappella Choir of Cleveland Heights, GEORGE STRICKLING, conductor.

2:00 to 4:30 p.m. Limited Attendance Clinics.
Subjects: "Successful Pulpotomies"
"Operative Procedures on Mixed Dentition"
"Control of Incipient Caries"
"Use of Fluorides"
"Are You Afraid of Children?"

2:00 to 4:30 p.m. Twenty-Five Instructive Table Clinics.

4:45 to 5:30 p.m. GEORGE W. TEUSCHER, D.D.S., Chicago, Ill.: Subject—"Save That Priceless Tooth!"

ALL DAY—EDUCATIONAL EXHIBITS & RADIO PROGRAMS

6:00 p.m. Dinner. Presentation of poster contest awards by Mayor Lausche.

7:00 p.m. DAVID L. THOMSON, Ph.D., Montreal, Canada: "The Twelve Points of Nutrition."

COUNCIL ON DENTAL EDUCATION

THE Board of Regents of the University of California has recently taken action giving the faculty of the college of dentistry the same professional status and privileges accorded to the faculties of academic departments. The announcement of this important action reads as follows:

1. That the same general criteria in use in academic departments, viz., ability as a teacher and achievement in research, be applied to full-time members of the faculty of the college of dentistry and that academic titles (instructor, assistant professor, associate professor and professor) be conferred if and when, after due investigation, it is determined by the president and committees of the faculty that such criteria have been met. Such titles should be conferred on either full-time or part-time members of the faculty who possess and have demonstrated the qualities described, but part-time academic status should be conferred only exceptionally.

2. That members of the faculty of the college of dentistry who do not qualify according to the criteria described under (1) be given clinical titles (clinical instructor, assistant clinical professor, associate clinical professor and clinical professor) and promoted on the basis of ability as teachers and clinicians. Persons in clinical status should be encouraged to do research; but appointment to clinical positions and advancement in rank and salary should be based primarily on teaching ability and professional accomplishments. Clinical titles will, if this recommendation is adopted, apply to most of the part-time faculty.

3. That the privileges of tenure, retirement, sabbatical leave, etc., be extended to both clinical and academic members of the staff, provided they devote not less than 50 per cent of their time to university duties, that they receive not less than 50 per cent of the salary appropriate to their rank and that persons devoting less than this amount of time be given such titles as lecturer or clinical demonstrator, and be not entitled to any of the privileges named. (Persons now giving less than 50 per cent of their time and holding either clinical or academic titles should not have these titles taken from them.)

4. That no member of the staff of the college of dentistry be promoted to an associate professorship or professorship, either clinical or academic, who does not devote 50 per cent or more of his time to the work of the college.

NATIONAL BOARD OF DENTAL EXAMINERS

FOLLOWING are the names of the successful candidates in Part 2 of the National Board examinations, October 25-26, 1943:

Tufts College Dental School
Thomas J. Ford
Albert C. Rock

St. Louis University
William J. Reynolds

Baltimore College of Dental Surgery
Morton Herbert Hollander
Leonard E. Quitt
George Y. Richman
Harold Hyman

GORDON L. TEALL, *Secretary.*

COMMITTEE ON LEGISLATION

PRESENT STATUS OF DENTISTRY IN THE ARMED FORCES: A REPORT FROM THE COMMITTEE ON LEGISLATION*

THERE has been much discussion of the present status of the dental corps in the armed forces, and some difficulties have arisen because of misstatement and misinterpretation of the facts in the case. The Committee on Legislation of the American Dental Association presents in the following statement a summary of the facts and of the record.

MEETING

In order to discuss this and associated problems, the committee will hold a meeting on Saturday, February 19, at 10 a.m., at the Headquarters of the American Dental Association in Chicago. All of those interested in the matter of improvement of the Dental Corps in the armed services are invited to attend and present their views. The committee will be particularly receptive to specific proposals or evidence which can form the basis for definite action.

INFORMATION

The committee is interested in obtaining all opinions and information so that it can outline its program in the best interests of dentistry. All communications to the committee will be held in strictest confidence and will be reviewed only by civilian members of the American Dental Association.

PRELIMINARY STATEMENT

As a preliminary to the details of the committee's report, certain statements should be made in the interests of a better understanding of some of the problems.

The Committee on Legislation is deeply interested in the final solution of problems that confront dentists in the armed forces, but also recognizes the value of an informed and orderly approach. Definite advances have already been made and more will be made in the future, but the task of overcoming long-standing ignorance and prejudice is not one that can be accomplished in a single day. This is merely one more of the problems—and an important one—that dentistry must solve in its evolution as a profession.

The profession of dentistry, as a unit, has no hesitation in serving under a surgeon general who is a member of the profession of medicine. This plan, dictated by the close association of dentistry and medicine in the interests of general health, is satisfactory. Members of the Association, in and out of the armed forces, therefore, have been ready to recommend improvement in the rank and authority of the Surgeon General. On the other hand, dentistry feels that it has a right to approach him directly in an official manner on problems that concern the profession.

Many of these problems that confront dentists in the armed forces have arisen from the fact that civilian practice is individualistic. The dentist himself has the final voice in decisions and procedures of practice. In the armed forces, however, it is of the utmost importance that this individualism be made secondary to the effective action of the Dental Corps as a military unit. This demands the establishment of military regulations and discipline, both of which are essential to the organization and maintenance of an effective military unit. Many dental officers, for example, are dissatisfied with the advancement that they receive in the services. Such advancement is not based upon a haphazard and arbitrary program, but upon a complex policy that limits the number and frequency of promotions in all branches of the service. Changes in this policy in the interests of dentists and their work have been made and will continue to be made, but it is important to remember that such changes are not readily brought about and are made by the authorities only when they are compatible with the best interests of the services

*Sterling V. Mead, Washington, D. C., Chairman.

at large. Many dentists, to cite another example, feel that they have been assigned to positions not related to their experience and abilities. This also is a problem on which progress has been made, but it is also one, to be plain spoken, that will never be solved entirely because it involves the opinion of the individual and the urgent necessities of the military program.

All of this should not cause any one to believe that perfection has been attained by any dental corps. There is need for improvement. The members of the dental corps know this to be true, and the chiefs of the medical departments of the Army and Navy know this to be true. On many points, the latter admit it, but they also feel that matters are being made more satisfactory as rapidly as possible and that improvement must come step by step so that there will be no interference in the common objective of complete and final victory.

AUTONOMY IN THE DENTAL CORPS OF ARMED SERVICES

With this preliminary statement as a background, the much-debated subject of autonomy for the Dental Corps of the armed services can be examined. Autonomy may be defined as the power, right or condition of self-government or, in its secondary meaning, as practical independence with nominal subordination. This definition is important since it provides the basis for a better understanding of a much misunderstood subject.

Dentistry had a long and difficult road to travel in demonstrating to the medical profession and other groups that it was worthy of recognition as an authentic health service. Today, dentistry is recognized as an essential factor in health service. From its very beginning as a profession, Dentistry has been autonomous. It has, however, maintained close and consistent relations with the other health service professions. Through the years, Dentistry has developed its own system of education, its own program for dental health, its own state board and licensing system and its own regulatory legislation. In many other ways, it has been separate from the practice of medicine. There is every reason to believe that this position is not only highly desirable, but also unassailably permanent.

The theory is often presented in the armed forces that Dentistry is a part of Medicine. In view of the historical record, there seems to be little justification for such an unmodified sentiment. There is still less justification for its use as an argument that dental practice should be dominated by medical practice. In civil life, there is a very distinct separation of medical and dental organization. Usually, the dentist, as such, is not given a footing of equality in the medical society or study group; or, if he is admitted, it is usually on the basis of associate membership with no real voice in the affairs or conduct of the society.

In military life, if dentistry is a part of medicine, why is the dental officer who is the senior of the medical officer not permitted to be the head of the medical department? Why is the dental officer not permitted to hold any office which can be held by a medical officer?

Those who urge that dentistry is a part of medicine are usually oblivious of these openly contradictory positions. If dentistry is to be considered as a part of medicine in military life in order to preserve certain aspects of medicomilitary authority and tradition, then, to be consistent, the same recognition must be extended in civil life. All dentists in the services must have all of the rights of physicians. Until this is the case, dentistry will consider this argument as an ill-advised gesture, not directed toward the interests of health or toward the maintenance of amicable professional relations, but toward the preservation of certain privileges that can be harmful to both.

On this question of autonomy, J. Oppie McCall has written:

> The question of autonomy for the Dental Corps in the Army is but one phase of the question of independence and autonomy for dentistry itself both in practice and in education. Those who favor the absorption of dentistry into medicine may well review some of the difficulties that have arisen in the administration of dental service in the army during this war. With the best will in the world on the part of medical officers and we hasten to credit them with that, the simple fact is that dentistry and dental service are too big and too complex to be grasped effectively by any human being if he must also be completely conversant with and able to deal with the problems bound up in medicine and medical service. This is the reason for the mistakes that have been made. Each field is big enough in

its own right to engage the complete attention of those who elect to study the problems of one or the other profession.

We can agree that the Surgeon General must be the final and overall authority in regard to all matters having to do with the health of the soldier. However, as regards dentistry, once certain fundamental policies have been agreed upon, the Dental Corps, under its own chief, should be free to carry out those policies. This is our conception of autonomy of the Dental Corps. Nothing short of this can be truly satisfactory.

The lack of autonomy manifests itself in many ways, some important and others less so. All division chiefs or department heads, to give a simple example, go to the executive officer to obtain leave of absence. The dental officer, because of present arbitrary conditions, must go to the medical officer and the executive officer for approval. It is difficult to see wherein the value of such discriminatory practices lies, or why, if they are admittedly discriminatory and valueless, they are not ended at once.

COOPERATION BETWEEN THE PROFESSIONS

It is unfortunately true that some of these conditions have given rise to misunderstanding and, in the stress of the times, have engendered ruffled feelings between the medical and the dental profession. To offset this, however, it should be remembered that, in the past few decades, there has been a close and sympathetic relationship between the two professions and that cooperation in the interest of the patient has been almost universal.

This cooperation has been built up not only out of a genuine understanding of common problems, but also out of the scientific facts that tie the professions closely together in their service of the public. It is common knowledge that many dental operations cannot be performed intelligently and effectively without some knowledge of the patient's physical condition and that this can best be supplied by a physician. On the other hand, it is also impossible to administer to all human ailments successfully without a knowledge of dental and oral conditions. The dentist, therefore, must rely on the physician for certain services essential to good practice, and the physician, in turn, must rely similarly on the dentist.

In the opinion of the Committee on Legislation, these forms of cooperation between the professions are generally accepted in civil life. There is an apparent unwillingness of high military officials to recognize this practical cooperation in civil life as an essential adjunct to military life. In addition, these high officials are not always aware that this cooperation is impaired or destroyed, for whatever reasons, by needless regulation or discrimination in certain phases of military practice.

If the relationship between the professions in civil life could be carried over, without substantial change, into military service, there would be less misunderstanding and present problems would be diminished. The Committee on Legislation does not believe that there is any real difficulty in carrying over this relationship, provided certain military officials are not unwilling to recognize its value and to take the necessary steps to secure and maintain it.

EFFORTS OF THE AMERICAN DENTAL ASSOCIATION

The Committee on Legislation and other officials and committees of the American Dental Association have been at work on these problems. Every effort has been made to secure correction of any difficulty through the action of the department concerned. When this is not successful, opportunity for Congressional action is sought. Those familiar with the legislative process in the federal government will realize that this is a time-consuming project. Comprehensive studies must be made and all suggestions evaluated before a plan of action is finally devised. This must then be supported by outstanding dentists from both civil and military life, and by dentists at large as well, before it achieves a reasonable chance of passage by Congress.

In order to advance this policy, the Committee on Legislation, prior to the meeting in Cincinnati in October, informed all members through dental publications that a meeting would be held to consider various legislative problems. Criticism and suggestions were invited and made. Through this procedure, the committee hoped to forestall injudicious comment and uninformed criticism, which react disdvantageously to the position of the American Dental Association in these important matters. Yet such comments and

criticism have been made, and, because they were based on misinterpretation and misconception, the chances of securing better regulation or legislation may be jeopardized. There is ample room for honest criticism and difference of opinion, but the committee cannot look with favor upon ill-advised statements that seek a momentary triumph for the few at the cost of eventual success for the many.

THE RECORD OF THE AMERICAN DENTAL ASSOCIATION

In order to stress the importance of the long-range program, as compared to the merely temporary or expedient, let us consider the achievements that have already been made.

In the First World War, many dentists served in the line, and Dentistry had no standing as a profession in the selective service methods of that day. At the beginning of the Second World War, a similar condition prevailed. Through extensive efforts on the part of the War Service Committee and of the Committee on Legislation of the American Dental Association, a suitable status was secured for dentists under the Selective Service regulations. The profession of law has not been able to obtain this consideration for its members, and many of its members are serving in the line as non-commissioned officers. Dentists, on the other hand, who have the necessary qualifications are taken into the services as officers before, or even after, they have been drafted.

The report of the Surgeon General for 1917-1918 shows that, in the American Expeditionary Forces alone, there were more than 2,000 dentists and dental students who were not commissioned. The record also shows that the Dental Corps was closed for commissions September 18, 1917 and was not opened again until October 3, 1918. The corps was closed again November 9, 1918.

Under the present Selective Service Act, about 200 dentists were taken into the armed forces as enlisted men and, of this number, 190 have been commissioned to date. In addition, the dental students of all of the dental schools, as well as those who have signified their intention of studying dentistry, have been given a definite status with the Army and Navy so that their education may be continued. Upon graduation, they will be taken into the services as commissioned officers.

These facts are in the record. The improvement in professional status for dentists in this war as compared to the last cannot be gainsaid, and much of it is due to the work of committees in the American Dental Association, who have been untiring in their presentation of the position and views of the members of the profession.

THE UNITED STATES PUBLIC HEALTH SERVICE

The efforts of the Committee on Legislation to obtain more recognition for the dental department of the U. S. Public Health Service have met with success. The bill to reorganize the service, which contained the necessary safeguards for Dentistry, was signed by the President December 1, 1943. William T. Wright, Jr., was named an assistant surgeon general of the United States Public Health Service with the rank of rear admiral. He is in charge of the Dental Division of the Office of the Surgeon General and has direct approach to the Surgeon General.

Rear Admiral Wright will be in charge of all activities, policies and programs that relate to dental personnel, research and policies. He will also develop plans, programs and policies for the Service in connection with all dental activities. The Dental Division will also exercise professional supervision of the dental officers of the service who are assigned for duty in other agencies of the government.

THE NAVY DENTAL CORPS

For many years, efforts have been made to secure the rank of rear admiral for the chief of the Navy Dental Corps. These efforts met with the opposition of the entire Navy Department and they were not aided by the appearance of any officer of the Dental Corps at the legislative hearings. Yet, in spite of these difficulties, the bill to provide a rear admiral was passed by Congress. With this permanent rank secured for the head of the Naval Dental Corps, the failure of the Bureau of Medicine and Surgery to make provision for an assistant surgeon general as dental director in the Office of the Surgeon General has placed the bureau in an indefensible position so far as the rights of Dentistry are concerned.

The bill passed by Congress created the

permanent rank of rear admiral in the Naval Dental Corps. It was understood among the members of Congress who aided the passage of this bill that a rear admiral would be appointed and placed in the Bureau of Medicine and Surgery. The members of the Navy Department who attempted to defeat the bill centered all of their criticism on this one point. They argued about the difficulties that might be created if a dentist of the rank of rear admiral were to serve in the Bureau of Medicine and Surgery while there was in the bureau an assistant surgeon general with the rank of captain. Such arguments did not cease even after the assistant surgeon general had been promoted to the rank of rear admiral, this nullifying the original contention. The argument then turned around the point that the assistant surgeon general's appointment was temporary while that of the dental rear admiral was permanent. The opponents of the bill also conveniently lost sight of the fact that, while they were disputing Dentistry's claim, the very condition of which they complained existed in regard to Medicine: two medical officers in the grade of rear admiral were serving under an assistant surgeon general at the bureau.

All of this was obvious evidence that the Navy Department did not want a dental rear admiral in the Bureau of Medicine and Surgery because he was a dental officer, and not because of the jurisdictional difficulties they cited. The members of Congress who aided in passage of the bill, however, expected the new dental rear admiral to be assigned to the Bureau of Medicine and Surgery to administer dental affairs. The members of the American Dental Association had similar expectations.

After his appointment, the rear admiral was sent to an inconspicuous assignment. When the attention of the Surgeon General was called to this disappointment, it was explained to the chairman of the Committee on Legislation, who had protested the assignment, that this was only a temporary matter calculated to provide indoctrination for future work. Immediately thereafter, rear admiral Lyle was named inspector of dental activities, which placed him in a position of great service. He now has the opportunity to visit stations all over the country and, because of his rank, is able to make suggestions that will be met receptively. Already he has mediated the correction of many irregularities in various naval installations. The dental rear admiral is now also in a position to visit the different war theaters and to take his findings directly to the Surgeon General.

In the Navy, at the present time, Dentistry has parity in appointments and promotions. The Surgeon General is especially friendly to the profession and has been cooperative at all times.

Two rear admirals are now on active duty with the Naval Dental Corps: Rear Adm. A. Lyle, recently appointed to that rank by act of Congress, and Rear Admiral Mack, retired, who has now returned to active duty as district dental officer of the Twelfth Naval District.

Potential opportunities do exist at the present time for misunderstanding in fields quite remote from the sphere of the Surgeon General. Such controversies are not always carried to the highest authorities. Another point of discrepancy is the ratio of medical men in the rank of rear admiral to the dental officers in the same grade. The Medical Corps now has eighteen officers of the rank of rear admiral; the Dental Corps has two. In the opinion of the Committee on Legislation, this unfavorable ratio can be partially redressed by the appointment of dental officers as inspectors in the grade of rear admiral.

In the Navy Dental Corps, dental officers do have the same authority (in regulations 1920) as other staff officers, but they are never in a position to administer their own affairs. This paragraph of the regulations is misleading since, under present conditions, the dental officer can never be the head of a medical department. In effect, therefore, the dental officer is always in a position subordinate to that of the medical officer holding that appointment.

The Dental Division in the Office of the Surgeon General may advise concerning appointments, promotions and supplies. The criticism offered by the dental profession on this point is that this procedure is possible only by permission of the Surgeon General and not by adopted regulation. Some plan of approach must be devised whereby a dental officer, through his commanding officer, may approach a dental director representing the Surgeon General without going through subordinate medical officers. Such a change

will have the necessary result and the Committee on Legislation is actively engaged in having this change made.

It has been hoped that the Surgeon General of the Navy would authorize this change by a revision of departmental procedure in order to avoid Congressional inquiry and action. This opportunity, however, has not been taken, and considerable time has already elapsed. If departmental revisions are not available for the correction of irregularities, the Committee on Legislation will feel impelled to employ a higher authority in order to secure the needed changes.

THE ARMY DENTAL CORPS

Members of the Committee on Legislation and officials of the American Dental Association have made many visits to the Army and to the Surgeon General of the Army. In these discussions, the former Surgeon General was unwilling to make any changes in the Dental Corps, stating that the corps had all of the representation in the higher brackets to which it was entitled. Because of this attitude, two bills were introduced into Congress to bring about the appointment of higher ranking dental officers in order to correct injustices. When these bills were introduced, the authors of the bills, Senator Hill and Representative Sparkman, went directly to the Surgeon General and the Secretary of War and informed them that if changes were not made, the bills would be urged to passage. This action had a very telling effect, and when the new Surgeon General was appointed, the chairman of the Committee on Legislation called upon him. The Surgeon General was of the opinion that there was no position of responsibility open to dentists that would justify the appointment of a brigadier general or of a major general. Because he is a man of great integrity, ability and understanding, however, the Surgeon General realized the advantage in giving the Dental Corps as much self-direction as possible and filling the responsible positions with men of the necessary rank.

The present Surgeon General, therefore, recommended the appointment of a major general for the Dental Corps. The appointment of brigadier generals in theaters where there is sufficient responsibility is now receiving his careful attention, and the committee is confident that the appointments will be made. The Surgeon General has promised the recommendation in two instances, possibly three. He has made many changes in the department, providing the same opportunity to medical and dental first lieutenants in their promotion to the rank of captain. He has been very cooperative with the members of the Dental Corps and stated that beneficial changes will be made.

With such cooperation, the Committee on Legislation will grant every opportunity for the correction of inadequacies by the department itself before seeking correction by legislation. The Surgeon General of the Army and the chief of the Army Dental Corps are in agreement that no legislation should be sought at the present time. The committee is satisfied to place this responsibility for adjustments in their hands.

The matter of promotion in the Army Dental Corps is not entirely in the hands of the Surgeon General. Recommendations for promotion must originate in the service command to which the officer is attached, and these recommendations must then be approved by the Secretary of War. This procedure provides a strong argument for the operation of the Dental Corps as a department similar to the Medical Department, so that there will be direct supervision only by the Surgeon General.

The following letter received by the committee from Maj. Gen. Robert H. Mills, chief of the Army Dental Corps, reveals his present attitude on various problems.

Replying to your letter of October 20, in which you request a statement of improvements in the status of the Dental Corps since Maj. Gen. Norman T. Kirk became Surgeon General, I am glad to submit the following:

a. His general friendly attitude to the Dental Corps, the effects of which will soon be felt throughout the Medical Department.

b. His efforts to have promotion from first lieutenant to captain in the Medical and Dental Corps made on an equal basis.

c. His willingness to have promotions to field grade in the Dental Corps made to fill positions of equal importance to which medical officers are promoted.

d. His recognition of the valuable service the Dental Corps is rendering by referring to it in many of his addresses.

e. His approval for the director of the Dental Division to take steps for the correction of a provision of the Act of March 3, 1911, which

adversely affects the status of the Dental Corps in relation to other branches of the Medical Department.

f. His official action in placing responsibility for the dental service upon members of the Dental Corps who are in responsible positions.

g. His agreed approval for promotion of dental officers to the grade of brigadier general to fill such important positions as that of senior dental officer in each of our major three theaters, when such recommendations are received.

h. His success in having the director of the Dental Division, Surgeon General's Office promoted to the grade of major general.

All of the above indicates that the Dental Corps will be given just recognition by the present Surgeon General.

I trust the above will be of some help to you in your editorial comment.

Sincerely yours,

(Signed) R. H. MILLS
Major General, U. S. Army

Major General Mills has also made the following comment in regard to the law of 1917:

The Act of October 6, 1917 applied to Regular Army promotions only and never to temporary promotions, even in the last war when the provisions of this act were in force. The provisions of this act have since been repealed by the Army Reorganization Act of June 4, 1920, which improved our status.

Inasmuch as the director of the Dental Research Division feels that he has authority by regulation (A.R. 40-15, December 28, 1942) to formulate plans and policies for the dental service and that he has received the full cooperation of the Surgeon General's Office for the advancement of dentistry, he can now show his leadership by attempting to educate the various service commands to the needs of dentistry and to secure promotions for dental officers on a parity with those of medical officers. If this cannot be done, the director of the Dental Division should be willing to lend his support to plans that will have the desired result.

CONCLUSIONS

From some quarters, there is an insistent demand for a separate dental corps. Since the work of the Medical Corps and that of the Dental Corps is so closely allied, it is felt by those who have made close study of the problem that a complete separation of the Dental Corps from the Medical Department in both the Army and the Navy would hinder the effectiveness of both corps. It is clear, however, that the welfare of the Dental Corps would be improved by autonomy.

There has been some confusion about the definition of the terms "autonomy" and "the complete separation of the medical and dental corps." The Dental Corps in both the Army and the Navy are already separate corps, but are under the jurisdiction of their respective medical departments. The chairman of the committee believes that what is sought is a separate department for the Dental Corps under the direction of a surgeon general. This parallels the situation that now obtains in Medicine.

One of the most important considerations in deciding this issue is whether or not the services themselves want it. It is one thing for civilian dentists and those temporarily within the armed forces to request such a step. It is another to obtain it by the persuasion and education of the leaders of the armed forces or of members of the House of Representatives and Senate committees. If such a step is taken, the Committee on Legislation will require the active support of members of the Dental Corps who are willing to make a forthright statement of their positions.

The matter of regulations for the Army and Navy Dental Corps has also been the matter of some discussion. The Army Dental Corps has printed regulations. There is a separate corps acting as a separate division in the Office of the Surgeon General, with a major general as assistant surgeon general. He is director of dental service and has a direct approach to the Surgeon General. All matters pertaining to dentistry must pass through the office of the dental director. The difficulty here is that medical officers in charge of service commands are able to overrule any dental plan inaugurated unless the dental director can secure complete cooperation.

The Navy Dental Corps is not so fortunate in this regard. There is a separate corps under the direction of the Bureau of Medicine and Surgery, but the Dental Corps is merely a division with no directing officer in the position of an assistant surgeon general or dental director.

These, then, are some of the problems which confront dentistry in the armed

forces. After a thorough study of the problem, the Committee on Legislation feels that three methods of solution are open for consideration:

1. The problems should be allowed to rest entirely with those officers who are in the services. Their activities in the past and their present unwillingness to take all steps for the correction of inadequacies demonstrate at once that this would not be the most productive policy.

2. Autonomy of the Dental Corps should be secured by the establishment of a separate department. This would give dentistry the control of its own affairs with responsibility directly to the Surgeon General. The head of the Dental Corps would be in reality an assistant surgeon general for dentistry. It may be possible to bring about this change by departmental ruling and without legislation if the facts are brought forcibly to the attention of the proper authorities. The Committee on Legislation is now exercising every effort to bring this about through departmental channels before having recourse to legislation.

3. A separate dental department entirely separate from the medical department should be established. Such a measure would divorce dentistry from medicine in the armed forces and there would be a separate surgeon general for Dentistry. In the opinion of the Committee on Legislation, a majority of the members of the corps do not desire such an actual separation, and it is the committee's opinion that the heads of the departments concerned are unalterably opposed to such a plan.

COMMITTEE ON ECONOMICS

A NOTE ON INCOMES IN THE PROFESSIONS—1941

RECENT issues of the *Survey of Current Business,* published monthly by the U. S. Department of Commerce, have carried reports on incomes in various professions. For the first time, the U. S. Department of Commerce reports, the average net income of physicians rose above the income of lawyers. For 1941, the average net income of physicians was $5,179; of lawyers, $4,832. In a similar survey, dentists were found to have an average net income of $3,773. All the professions have shown appreciable increases in income over the preceding years.

It is necessary, however, to accept the reports on the medical and legal professions with considerable reservation. The report on income of physicians was based upon approximately 1,900 questionnaires, and on lawyers upon approximately 2,600 questionnaires. Returns were received from less than 2 per cent of those practicing in each of these professions. In the survey of the income of dentists made by the Committee on Economics in cooperation with the U. S. Department of Commerce, more than 13,000 questionnaires were returned, or by about 17 per cent of all practicing dentists.

It was estimated that the American public spent approximately $1,087,000,000 for the services of physicians in 1941. This is roughly twice as much as was spent by the public for dental care in the same year.

A detailed report of the economic status of the dental profession, covering gross and net incomes, differences in income over the country, by specialties and by age, was presented in the November 1943 issue of THE JOURNAL.

J. E. BAGDONAS, *Secretary,*

Committee on Economics.

COUNCIL ON DENTAL THERAPEUTICS

FOUR PER CENT PROCAINE SOLUTIONS—NOT ACCEPTABLE FOR A.D.R.

A COPY of this report was sent to the two firms mentioned in the report, namely William H. Rorer, Inc., and Mizzy, Inc. Replies received from the firms were considered by the Council, which then voted to present the report for publication in its original form.

DONALD A. WALLACE, *Secretary.*

WHILE 2 per cent procaine solutions are entirely adequate for most dental procedures, it is probable that all dentists encounter an occasional case in which profound anesthesia is not obtained by solutions of that strength. It is possible that, in many instances, this is a result of poor injection technic, but there would also seem to be a certain number of cases in which satisfactory anesthesia is not obtained, even with a careful technic. This fact is reflected in frequent attempts by manufacturers or members of the profession to produce a more effective solution by the introduction of new compounds, the mixing of existing anesthetics (e.g., novocain, pontocaine, cobefrin[1]) or the use of unusually strong solutions of procaine. At the present time, there seems to be a wave of interest in the use of 4 per cent procaine solutions.

William H. Rorer, Inc., has recently applied for Council acceptance of a 4 per cent procaine solution with epinephrine 1:50,000. Mizzy, Inc., has advertised a 4 per cent solution of procaine with neo-synephrine 1:2,500. Although 4 per cent solutions are not new, there seems to be surprisingly little information available concerning their clinical efficiency. "Clinical Anesthesia," by John S. Lundy,[2] carries a brief reference to 4 per cent procaine solutions, but no data other than the statements of the author are presented. This seems to be largely the basis for the Rorer application for Council acceptance of their 4 per cent procaine solution since their proposed advertising circular is essentially a repetition of the Lundy statements.

The proposed circular begins, "The depth of anesthesia obtained on injection of procaine depends more on the concentration of the procaine than on the quantity of the solution used." We have been unable to confirm this statement otherwise than by the Lundy reference. The indications for the use of 4 per cent procaine solutions are said to be especial hypersensitivity in certain areas; e.g., in the extraction of teeth with early symptoms of periapical infection and the preparation of cavities in the gingival areas of mandibular teeth. It is stated that the routine use of 2 per cent procaine has established itself as satisfactory for ordinary procedures. These claimed indications would seem to be reasonable, especially when compared with a recent advertisement of Mizzy, Inc., in which Oradent 4 per cent Procaine with Neo-Synephrine 1:2,500 is recommended for routine operative procedure.

The Rorer proposed circular quotes Lundy, "Considering the small quantity of procaine solution used in dental operations, there is no contraindication of a 4 per cent solution when such use is indicated: this concentration will permit the performance of any dental operation without pain to the patient and this includes preparation of cavities of hypersensitive teeth." From the standpoint of systemic toxicity, the first part of this statement might be acceptable

since 0.5 gm. has been suggested as a conservative dosage of procaine for any surgical operation and as much as 3 gm. has been employed without untoward symptoms.[3] Since the average dental operation requires average injections of perhaps 3 cc., and seldom more than 5 cc., it is obvious that the maximum quantity of procaine that a patient would usually receive, even with 4 per cent solution, is not more than 0.2 gm. This is well below the estimated conservative dosage, and serious systemic toxicity would not seem to be an important consideration, but attention is called to the further statement of Goodman and Gilman, "Procaine should be employed in the lowest concentration and the smallest total amount compatible with the needs of the surgical procedure."[4] Occasionally, toxic effects occur even with small doses (0.01 to 0.13 gm.)[5]

With reference to the second part of the foregoing quotation from Lundy, it is questioned whether sufficient evidence is available to support a claim that any dental operation can be performed without pain to the patient by using a 4 per cent procaine solution. Individual skill in the matter of injection technic will have much to do with the success of anesthesia regardless of the solution used.

The Rorer proposed circular further suggests that injection of 4 per cent procaine solution be employed instead of the intraosseous method of anesthesia, since it is less cumbersome and less liable to produce deep infection. It is no doubt true that intraosseous injections are more cumbersome and more dangerous, but the important question left unanswered, except for the statement by Lundy, is, "Will injection of 4 per cent procaine have the same results as intraosseous anesthesia?"

Available data are inadequate to justify the routine use of 4 per cent solutions of procaine.

There may be occasional instances in the practice of dentistry in which a local anesthetic solution more potent than 2 per cent procaine is desirable. However, it is easy for the dentist to prepare such a solution extemporaneously, and it is neither necessary or desirable that ready prepared solutions of unusually high potency be available commercially. Certainly it would be unfortunate if the well-established use of 2 per cent solutions in routine dental procedures were to be supplanted by the use of 4 per cent procaine solutions.

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CORRESPONDENCE

"DENTAL PRACTICE AND DENTAL EDUCATION IN THE FUTURE; WITH CONSIDERATION OF SOCIAL AND HEALTH ASPECTS"

To the Editor:

THE American Dental Association very wisely protects its membership from radical statements and writings appearing within the covers of THE JOURNAL as the accepted or projected thinking or policy of the Association or membership at large by the publication each month on the editorial page of the following statement: "All expressions of opinions and all statements of supposed facts are published on the authority of the writer over whose signature they appear, and are not to be regarded as expressing the views of the American Dental Association, unless such statements or opinions have been adopted by the Association." This clause permits the Editor to publish articles which in his judgment should be disseminated to the membership. In carrying out one of the tenets of our democracy, "Freedom of Speech," there appeared in the January 1944 issue (page 16) of THE JOURNAL an article by John Oppie McCall, A.B., D.D.S., of New York City, "Dental Practice and Dental Education in the Future; with Consideration of Social and Health Aspects."

As President of the American Dental Association, I ask every member to read this article because it will give one an idea of the speculative thinking that is being indulged in by some members of the profession whose names in the past have been closely identified with the elevation of undergraduate, graduate and postgraduate education in dentistry and with the advancement of dental science, but who now, in time of world stress and strain, are actually advancing theories exactly opposite to the views of the majority of members of the American Dental Association. Whether this is the result of having been placed in a position where they see an immediate need, or whether they have become so alarmed at statistics portraying the great public need for dentistry that they are willing to completely change and lower the standards of dental practice to satisfy the alarmists, is not clear. The prevention and cure of the common cold has not been solved by our colleagues in medical science with all their auxiliaries, yet medical practice, as we know it, has not lowered its standards.

As President of the American Dental Association, I assure those who agree with that article that there is no backdoor to the practice of dentistry; that there can be no abbreviated methods of dental education or practice; that we cannot separate the simple occlusal or fissure cavity from the mesioclusal; that the placing of amalgam in a pit cavity is as important as placing one in a mesioclusal cavity, and that a full dental course of training will continue to be a requirement for an operation to fill children's teeth as pressing as the preparation of teeth for crowns and bridges, the New Zealand plan, which the article refers to, notwithstanding.

The child is even more important to the future of our country than the adult. More skill is required to treat children than adults, and the principles of treatment are, and forever must be, the same. The paradox is that the author heads an institution maintained to provide dental treatment for children.

What we need is not less education in the basic sciences and in other fields, psychology for instance, but more, if we are to provide even a minimum dental service for children. The past ten years saw a great increase in graduate and postgraduate training for dentists in the field of children's dentistry and in organizations interested in the subject, and yet, with all this advance, comes one who advocates less. One wonders if, from his nearness to the field of children's dentistry, as director of a great clinic in New York City, the author sees the forest, but not the trees.

The author's thoughts in the field of prosthetic dentistry are unusual, to say the least. How one trained in dental science can remove artificial denture construction from the field of the scientifically trained dentist and place it in the hands of those with abbreviated training is beyond comprehension. There is no analogy between the stump of a

leg and the human mouth, yet the article would have us believe so.

It is unfortunate that the author touched upon the subject presented on pages 22 and 23 of his article in THE JOURNAL—"The Physician Looks at Dentistry." My long and intimate experience with medical men assures me that, as a group, they hold dentists and dentistry in the highest esteem and respect. They appreciate and realize that dentistry, like medicine, has a great public health problem. They do not expect dentistry to solve its problem any faster than medicine has its many age-long problems. They certainly hope that dentistry will never permit the development of the many cults that medicine has, and that the author now advocates for dentistry. I am sure that medicine is interested to learn that medicine failed to find a place for the chiropractor as either a specialist of medicine or as an auxiliary. Medicine and dentistry are brothers. Although one is younger, there is mutual respect, and they are destined to go forward together to protect the public from the idle plans projected from within and without the profession.

The sections dealing with "Dentistry in the Practice of the Future," "Provision of Dental Care for All" and "Effect on the Dental Profession" all point to social planning of a "forest and trees" nature. As President of the American Dental Association, I believe that the dental profession of this country is mindful of its responsibility in the field of public health, but it will fight vigorously any hysterical legislation or planning in the development of dental programs, which at first may appear to some to be the solution to the complex problem of dental health. Dentistry has a formula which can be adapted to any community level.* Of course, it does not ask every one to run to the state or national capital for money or subsidy. Any one interested, legislator, civic worker, bureaucrat, social worker, can obtain the formula by writing to the Central Office, American Dental Association, Chicago, Ill.

Dentistry does not want so-called socialization or regimentation of the profession in any form. Dentistry is making, but will not adopt, plans for the public or dentistry until all its members are back from the war and can give of their wisdom and experience in developing "the future of dentistry."

I ask each member to think for himself and not to be swayed by those who suggest or advocate the lowering of our standards of education, practice or treatment.

C. RAYMOND WELLS, *President.*

*Programs for dental health, National Health Program Committee of the American Dental Association.

OBITUARIES

A. BROMLEY ALLEN, D.D.S.

(1862-1943)

A. BROMLEY ALLEN was born at Lake Geneva, Wis., April 12, 1862; died in Los Angeles, Calif., August 11, 1943.

Dr. Allen practiced his specialty of oral surgery in Chicago from 1904 until 1925, when he retired, moving to California, where he resided until his death.

During his years of practice, Dr. and Mrs. Allen traveled extensively in Europe and Asia. He will always be remembered as a jovial and big hearted friend to every one in dentistry.

Dr. Allen attended the Chicago College of Dental Surgery, 1891-1892, where he was a member of Delta Sigma Delta.

Dr. Allen enjoyed a very lucrative practice. He was the first president of the American Society of Oral Surgeons, and the only president to hold that office for two years, 1918-1919. In 1934, during the San Francisco meeting, he was tendered a banquet.

Burial took place in Hollywood Cemetery.

Mrs. Allen, formerly Miss Julie Conklin, to whom Dr. Allen was married in 1906, survives.

HARRY ANDREW ALLSHOUSE, D.D.S.

(1895-1943)

HARRY ANDREW ALLHOUSE, of Kansas City, Mo., died Tuesday at a hospital in Wichita, Kan., and was buried in Hannibal, Mo.

Dr. Allshouse formerly lived at 6131 Mission Drive, Kansas City, and maintained his office for the practice of orthodontia at 333 Brookside Plaza, practicing also in Wichita since May 1942.

He was a past president of the Missouri Dental Association, the American Association of Orthodontists and the Kansas City Dental Society. For several years, he served as head of the department of orthodontics at the University of Kansas City Dental College.

Born in Hannibal in 1895, Dr. Allshouse began practicing dentistry in Kansas City twenty-five years ago, after serving as an officer in the medical corps in the First World War.

HARRY ANDREW ALLSHOUSE, D.D.S.

Besides his widow, the former Mrs. Abigail Eaton, whom he married in 1940, he is survived by his mother, Mrs. Sarah E. Allshouse, Park Lane hotel, and a stepson, William Eaton.

DEATHS

ADAIR, J. M., Lexington, Va.; Baltimore College of Dental Surgery, Dental School, University of Maryland, 1916; died November 12; aged 53.

AHERN, JOHN J., Springfield, Mass.; Tufts College Dental School, 1913; died July 22; aged 55.

ARMSTRONG, E. E., Cherryvale, Kan.; St. Louis University School of Dentistry, 1901; died October 8; aged 68.

ARMSTRONG, STANLEY E., New Haven, Conn.; Georgetown University, School of Dentistry, 1910; died December 10; aged 56.

BABCOCK, GRANT, Greeley, Ill.; Keokuk Dental College, Dental Department of Keokuk Medical College, 1907; died November 10; aged 63.

BAKER, MILES L., Kankakee, Ill.; Washington University School of Dentistry; 1921; died December 8; aged 46. Dr. Baker was a major in the U. S. Army.

BARNES, V. E., Cleveland, Ohio; Western Reserve University, School of Dentistry, 1899; died November 25; aged 68.

BEARDSLEY, ADDISON P., Dorchester, Mass.; Pennsylvania College of Dental Surgery, 1903; died December 12; aged 68.

BEITZEL, W. G., Atchison, Kan.; Thomas W. Evans Museum and Dental Institute School of Dentistry, University of Pennsylvania, 1892; died November 3; aged 71.

BERWALD, JOSEPH M., Elizabeth, N. J.; Baltimore College of Dental Surgery, 1911; died December 17; aged 67.

BILLINGS, H. LEROY, Cambridge, Mass.; Thomas W. Evans Museum and Dental Institute School of Dentistry, University of Pennsylvania, 1909; died December 21; aged 56.

BLAKE, V. G., Sullivan, Mo.; died August 25.

BOLSINGER, GEORGE E., Tacoma, Wash.; Chicago College of Dental Surgery, Dental Department of Loyola University, 1906; died June 22.

BOS, CHRISTIAN, Batesville, Ind.; Indiana University School of Dentistry, 1904; died November 30; aged 62.

BRANTLINGER, FRANCIS, Pittsburgh, Pa.; University of Pittsburgh, School of Dentistry, died December 3; aged 36. Dr. Brantlinger was a lieutenant in the U. S. Army Dental Corps.

BRIGHTBILL, HARRY R., Bedford, Pa.; Baltimore College of Dental Surgery; died November 9; aged 56.

BURKE, EDWIN, Chicago, Ill.; United States Dental College, Chicago, 1891; died December 22; aged 84.

BURNETT, FRANK HOWARD, Phoenix, Ariz. (formerly of Duluth, Minn.); Minnesota College Hospital, Dental Department, 1888; died in December; aged 84.

CASTIN, THOMAS E., Buffalo, N. Y.; University of Buffalo, School of Dentistry, 1924; died July 23; aged 43.

CHARBONNEAU, CECIL K., Flatbush, N. Y.; Baltimore College of Dental Surgery, 1918; died July 28; aged 47.

CLARK, EDWARD L., Salt Lake City, Utah; Chicago College of Dental Surgery, 1915; died November 7; aged 59.

COOPER, J. L., Meridian, Miss.; died November 27.

CRUME, L. G., Bardstown, Ky.; University of Louisville, School of Dentistry, 1901; died November 15.

DANIELS, T. M., Worcester, Mass.; died December 9.

DAVIDSON, WALTER E., Pittsburgh, Pa.; University of Pittsburgh, School of Dentistry, 1905; died December 3; aged 68.

DAY, CHESTER O., Long Beach, Calif., University of Southern California, College of Dentistry; died October 30; aged 60.

ECKFIELD, CLARK C., Lake Worth, Fla. (formerly of Marion); Ohio Medical University, College of Dentistry, 1906; died August 28; aged 67.

EDELMAN, ARTHUR J., Jersey City, N. J.; Ohio State University, College of Dentistry, 1941; died December 8; aged 24.

EGAN, CHARLES F., Waterbury, Conn.; Thomas W. Evans Museum and Dental Institute School of Dentistry, University of Pennsylvania; died December 14; aged 56.

ERNST, WILLIAM, Clayton, Mo.; St. Louis University School of Dentistry, 1905; died November 22; aged 64.

FLYNN, EDMUND F., Taunton, Mass.; Tufts College Dental School, 1886; died November 12.

FOREMAN, J. R., Clinton, Mich.; University of Michigan, College of Dentistry, 1909; died November 19; aged 59.

FRACKELTON, WILL, Sheridan, Wyo.; American College of Dental Surgery, 1891; died December 28; aged 74.

FRIEDBERG, HERBERT, Atlantic City, N. J.; Thomas W. Evans Museum and Dental Institute School of Dentistry, University of Pennsylvania. Lieutenant Friedberg was killed in action while serving with the Army Medical Corps at Attu; aged 29.

GACHET, JAMES E., Memphis, Tenn.; Atlanta Dental College, 1898; died December 11; aged 71.

GIBBS, WALLACE DUNCAN, Charlotte, N. C.; University of Maryland, School of Dentistry and the Baltimore College of Dental Surgery; died July 23; aged 50.

GIFFEN, R. S., Sacramento, Calif.; died September 3; aged 62.

GIRLS, CALVIN L., Muscatine, Iowa; State University of Iowa, College of Dentistry; died July 17; aged 80.

GODFREY, JOHN, Darien, Conn.; Baltimore College of Dental Surgery, 1905; died December 14; aged 66.

GONZALES, FRANK B., Glendale, Calif.; died November 3.

GREENSPAN, LEON J., Philadelphia, Pa.; Thomas W. Evans Museum and Dental Institute School of Dentistry, University of Pennsylvania, 1906; died June 21; aged 65.

GUEST, JOSEPH C., Fort Worth, Texas; Vanderbilt University, School of Dentistry, 1909; died November 8; aged 59.

HAGGERTY, W. D., Hackensack, N. J.; Baltimore College of Dental Surgery, 1901; died November 23; aged 63.

HATFIELD, ALVIN A., Danville, Ky.; died November 15.

HAWKINS, A. L., Tulia, Texas; died October 29; aged 81.

HAYDEN, RALPH E., Dayton, Ohio; Chicago College of Dental Surgery; died December 2; aged 68.

HEARN, RODNEY L., Seattle, Wash.; Texas Dental College, 1910; died November 28; aged 64.

HENCHEY, WILLIAM J., Troy, N. Y.; Pennsylvania College of Dental Surgery, Philadelphia, 1898; died November 15; aged 77.

HERTZ, C. H., Hazelton, Pa.; Thomas W. Evans Museum and Dental Institute School of Dentistry, University of Pennsylvania, 1902; died in June; aged 63.

HUDSON, HENRY J., Philadelphia, Pa.; Thomas W. Evans Museum and Dental Institute School of Dentistry, University of Pennsylvania, 1914; died October 31.

HUGHES, CLARENCE DAVID, Newport, Ky.; Cincinnati College of Dental Surgery; died November 23; aged 48.

HULL, AUBREY S., Salt Lake City, Utah; died July 16; aged 65.

HURST, ORVILLE C., Baltimore, Md.; University of Maryland, School of Dentistry and the Baltimore College of Dental Surgery, 1920; died November 28; aged 41.

IDLEMAN, LLOYD D., Salem, Ore.; died December 8; aged 64.

JACOB, EDWARD, Gary, Ind.; Chicago College of Dental Surgery, Dental Department of Loyola University, 1902; died December 3; aged 68.

JAHR, FRANK, Kansas City, Mo. (formerly of Fort Wayne, Ind.); Western Dental College, 1898; died in November.

JENNINGS, E. C., Brooklyn, N. Y.; University of Pennsylvania School of Dentistry; died December 19; aged 63.

JOHNSON, EDWIN C., Ashland, Wis.; Chicago College of Dental Surgery, Dental Department of Loyola University, 1904; died August 24; aged 64.

JOHNSON, HARRY C., Memphis, Tenn.; Vanderbilt University, School of Dentistry, 1902; died August 24; aged 62.

KANE, ALBERT J., Geneva, New York; New York College of Dentistry, 1924; died December 11; aged 50.

KASBEER, J. W., Bloomington, Ill.; University of Michigan, College of Dental Surgery, 1893; died December 10; aged 74.

KAUFMAN, FRANK, Northport, L. I., N. Y.; New York College of Dentistry, 1912; died December 20; aged 52.

KELLER, FRANK R., Robbinsdale, Minn.; University of Minnesota, College of Dentistry, 1910; died November 27.

KELSEY, CHARLES E., Albuquerque, N. M.; Ohio College of Dental Surgery, Dental Department of the University of Cincinnati, 1899; died July 13.

KERN, GEORGE, Johnstown, Pa.; killed by robbers, December 11; aged 61

KILLEN, R. P., Columbus Grove, Ohio; In-

diana University School of Dentistry, 1895; died July 25; aged 68.

LEHMBERG, L. E., South St. Louis, Mo.; Washington University School of Dentistry, 1895; died July 25; aged 68.

LUDES, JOSEPH, Harrisburg, Pa.; Thomas W. Evans Museum and Dental Institute School of Dentistry, University of Pennsylvania, 1903; died December 7; aged 67.

LUEBEN, S. C., Kerkhoven, Minn.; University of Minnesota, College of Dentistry, 1915; died November 11; aged 51.

M'CLURE, C. E., Henderson, Ky.; University of Louisville, School of Dentistry, 1903; died July 18; aged 66.

MCDONALD, WILLIAM S., Shawnee, Kan.; Kansas City Dental College, 1890; died October 15; aged 81.

MCEUEN, SETH HOYT, Coeur D'Alene, Idaho; died November 18; aged 77.

MCGRAW, FRANK L., Scranton, Pa.; Baltimore College of Dental Surgery, 1890; died November 29.

MCMASTER, OSCAR F., Los Angeles, Calif.; University of Illinois, College of Dentistry, 1904; died July 24.

MCMENAMIN, HUGH, Scranton, Pa.; Temple University School of Dentistry, 1907; died November 17.

MCMILLEN, G. A., Alton, Ill.; Washington University School of Dentistry, 1879; died August 8; aged 87.

MCTYRE, LEONIDAS EDWARD, Savannah, Ga.; Atlanta Dental College, 1897; died November 14; aged 71.

MACKEY, WILLIAM J., Lenox, Mass.; Tufts College Dental School, 1916; died December 11; aged 49.

MARTIN, WILLIAM EDWIN, Rock Island, Ill.; Indiana University School of Dentistry, 1902; died December 4; aged 63.

MARTIN, WINFIELD S. H., Rutherford, N. J.; Baltimore Medical College, Dental Department, 1905; died December 6; aged 63.

MASON, B. RUSH, Salisbury, Mo.; St. Louis University School of Dentistry, 1909; died November 23; aged 60.

MASON, WILLIAM C., Erie, Pa.; Pennsylvania College of Dental Surgery, 1887; died December 17; aged 78.

MATTISON, GEORGE ERNEST, Richmond, Calif.; died December 1; aged 72.

MAYER, H. G., Indianapolis, Ind.; Indiana University School of Dentistry, 1909; died November 18; aged 56.

MELANSON, ASHBEL D., Jennings, La.; New Orleans Dental College, 1906; died August 3; aged 58.

MORGAN, ROY LESTER, Washington, Kan.; Kansas City-Western Dental College, 1922; died October 23; aged 45.

MORRISON, JOHN D., Ridgefield Park, N. J.; Thomas W. Evans Museum and Dental Institute School of Dentistry, University of Pennsylvania, 1915; died December 19; aged 53.

MOULTIS, FRANK W., Northampton, Mass.; Tufts College Dental School, 1916; died August 6.

MULLEN, HOWARD L., New York, N. Y.; School of Dental and Oral Surgery of Columbia University, 1924; died November 22; aged 44.

MURRAY, WILLIAM P., Mt. Washington, Ky.; Cincinnati College of Medicine and Surgery, Dental Department, 1894; died July 28.

MURTO, FRANK D., Pittsburgh, Pa.; Thomas W. Evans Museum and Dental Institute School of Dentistry, University of Pennsylvania, 1902; died August 2; aged 75.

MUSGRAVE, E. E., Oklahoma City, Okla.; Western Dental College, 1906; died October 18.

NEUMULLER, WILLIAM C., Lansford, Pa.; Pennsylvania College of Dental Surgery, 1900; died November 25; aged 66.

NICHOLS, HARRY C., Huntington, W. Va.; died December 2; aged 58.

NILES, G. C., Guntersville, Ala.; Birmingham Dental College, 1914; died July 21; aged 58.

NOBLE, WALTER R., Philadelphia, Pa.; Thomas W. Evans Museum and Dental Institute School of Dentistry, University of Pennsylvania, 1900; died November 11; aged 72.

NORTHCROFT, GEORGE, London, England; University of Michigan, 1890; died November 17; aged 74.

OWEN, EDWARD ASHTON, Thermopolis, Wyo.; School of Dentistry, University of Denver, 1904; died July 12; aged 61.

INCIDENTS OF PRACTICE

Broken Tooth Penetrating Lip

By Ely Rosenthal, D.D.S., and Martin T. Siegel, D.D.S., Poughkeepsie, N. Y.

A man seen in the dental department of a local hospital complained of a swollen lower lip. There was a history of accidental injury of the lip, at which

Tooth fragment removed from lip.

time the maxillary incisor had been broken. X-ray examination revealed a piece of the broken tooth deeply penetrating the lower lip. Removal of the fragment was followed by uneventful healing.

27 Cannon Street.

Case of Migrating Tooth

By P. Ray Newling, D.D.S., Adelaide, Australia

The case of a migrating tooth reported by Carrick in the December 1942 issue of The Journal brought to mind a similar case which I encountered in 1922. The patient was also a girl of 16, healthy and well developed. Her mother stated that she had never had any permanent teeth removed, and an x-ray examination disclosed congenital absence of the lower lateral incisors, as well as the migrating tooth, the presence of which caused no symptoms. The roentgenograms indicate the rate of migration. The movement of the tooth caused no pain or other difficulty. I am unable to give any further information regarding the case as I have not seen the patient for many years.

Shell House, North Terrace.

Residual Root Fragment with Cyst

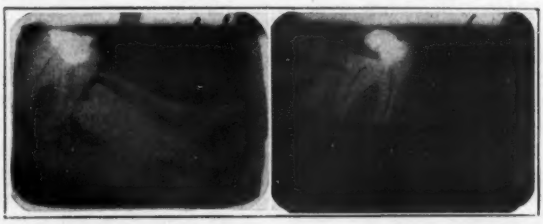
By Martin T. Siegel, D.D.S., Poughkeepsie, N. Y.

A woman complained of pain in the maxillary left area in the canine region. The x-ray film revealed a residual root fragment with a cyst under a permanent

Root fragment with cyst, under bridge.

bridge. The elimination of infection relieved the pain. This case shows the importance of an x-ray examination before bridges or dentures are constructed.

27 Cannon Street.



Migrating tooth.

CURRENT LITERATURE

Journal of Oral Surgery

October 1943

Titles marked with an asterisk are reviewed below.

*Ameloblastoma of the Mandible with Metastasis to the Lungs: Report of Case. Fred C. Schweitzer M.D., and William F. Barnfield, D.D.S., St. Louis, Missouri—287.

*Recent Experiences with Skeletal Fixation in Fractures of the Mandible. Robert H. Ivy, M.D., D.D.S., F.A.C.S., and Lawrence Curtis, M.D., D.D.S., F.A.C.S., Philadelphia, Pa.—296.

*Undiagnosed Primary Carcinoma of the Gingiva with Widespread Metastasis: Report of Case. Lester W. Burket, D.D.S., M.D., Philadelphia, Pa.—309.

*Osteomyelitis of the Jaws. Carl W. Waldron, M.D., D.D.S., Minneapolis, Minn.—317.

*Osteopetrosis: Report of Case. Herbert J. Bloom, M.S., D.D.S., Ann Arbor, Michigan.—340.

*Adenocarcinoma Originating from Aberrant Tissue in the Gingiva: Report of Case. Martin J. Loeb, M.D., New York, N. Y.—347.

*Cleidocranial Dysostosis: Report of Two Cases. Robin M. Rankow, D.D.S. Fort Sam Houston, Houston, Texas—352.

*Carcinoma of the Indifferent Cell Type Involving the Maxillae: Report of Case. John H. Gunter, D.D.S., M.D.; Alton J. Novak, B.S. in Phar., D.D.S., and Herman R. Churchill, D.D.S., Dr. med. dent., Philadelphia, Pa.—360.

*Restraining of Patients for General Anesthesia in Dental or Surgical Chairs. Ralph G. Peterson, D.D.S., Minneapolis, Minn.—366.

*Contagious Parotitis (Mumps) Coincidental with Tooth Extraction: Report of Case. A. Sanchez de Bergue, Ciego de Avila, Cuba—372.

Ameloblastoma of the Mandible with Metastasis to the Lungs: Report of a Case

AMELOBLASTOMAS — adamantinomas—ordinarily do not mestastasize. The case here reported is interesting because evidence is submitted that metastasis to the lungs occurred from a primary ameloblastoma in the mandible. The disease was discovered in 1928 and terminated fatally in 1942. The tumor maintained its cytologic characteristics through many episodes of extension with surgical intervention. The final specimens obtained from the lungs showed ameloblastoma without anaplastic changes to carcinoma. A review of available reported cases of metastasizing adamantinoma is made in the article. It seems that the case here reported may be the only one on record of lung metastasis from an unaltered ameloblastoma.

Recent Experiences with Skeletal Fixation in Fractures of the Mandible

Present skeletal fixation is based on Parkhill's work in 1897. Credit is given Fairbank, Stout and Waldron, as well as the Tower Company, for adaptations of the Roger Anderson appliance. Skeletal fixation is indicated only when teeth are absent or adequate intra-oral control of fragments is impossible. The technic is described and illustrated. Strict asepsis is necessary. The pins should be placed without previous drill-hole preparations. The authors use an "egg-beater" type hand drill. The pins are inserted through one cortex and the medulla and into the next cortex. Two well illustrated case reports in which skeletal fixation is used accompany the article.

Undiagnosed Primary Carcinoma of the Gingiva with Widespread Metastases: Report of Case

EVIDENCE submitted in this case report may indicate the presence of a primary gingival carcinoma with general metastasis. The patient, a man, aged 57, was first observed because of pain in the legs, weakness and dyspnea. Examination revealed lung and vertebral complications compatible with bronchogenic malignancy. One month later,

the patient died, after vertebral laminectomy. No report on the oral examination at admission was available. At necropsy, a generalized metastasis was discovered and also an epulis-like, non-ulcerated carcinomatous mass, 1 cm. by 1 cm., on the gingiva, near the lower right second bicuspid. In view of the fact that "neither the gross nor the histologic findings in the bronchi were characteristic of primary carcinoma of the bronchus," it is assumed that the primary lesion may have been gingival. A plea is made for more complete examination of oral structures, particularly with reference to general disease and neoplasia.

Osteomyelitis of the Jaws

THIS article covers the subject of osteomyelitis of the jaws, including: bacteriology, etiology, general considerations, pathology, anatomy, symptoms, diagnosis, treatment and case reports. So much compact, essential information is presented that abstraction is virtually impossible.

Osteopetrosis: Report of Case

OSTEOPETROSIS, or "marblebones," manifests itself primarily by excessive calcification of osteoid tissue without ossification, the skeletal cortex increasing in size with obliteration of the medullary portions of bone. The pathologic findings and symptoms are due to these characteristics. The etiology is unknown, although the parathyroids are suspected. A wide face, broadly separated eyes and alar cartilages are common. Dental caries and imperfect eruption of teeth are the rule. Jaw necrosis resulting from dental disease and limited blood supply frequently occurs. Loss of bone marrow brings on anemia and leukopenia. Roentgenographic evidence, together with the history, is usually diagnostic. The rate of progress is variable, ranging from arrest to rapidity. Heredity may be a factor. The case reported was that of a woman, aged 25, whose chief complaint was pain with discharge, intraorally, from the right mandible and extraorally under the left eye. A few teeth had been removed and drainage had persisted for nine months. Other teeth were removed during this time, with the same sequence of events. Broad facial characteristics were present. The alveolar bone was exposed and necrotic in many places. All bones were thickened. The red cell and white cell counts and the hemoglobin were low. Optic atrophy was present. All bones, roentgenologically, were dense. The hospital course was uneventful. The bone necrosis continued without sequestration.

Adenocarcinoma Originating from Aberrant Tissue in the Gingiva: Report of a Case

ONE would not expect adenocarcinoma to occur on the gingivae because of the absence of glandular epithelium in this area. Therefore, the presence of such a tumor on the gums near an upper molar is conceived to have its origin in aberrant tissue. The case here reported involved a woman, aged 32, with a history of painful swelling on the gums near an upper first molar, of six years' duration. No fever or discharge was present. A non-malignant epulis was suspected from the duration and appearance. Biopsy, however, revealed adenocarcinoma. A wide resection of the area, including a block of bone, followed by x-ray therapy, resulted in a six-year cure. The maxillary sinus, which was involved at operation, was normal, this fact apparently ruling out the antral membrane as the source of the glandular epithelium.

Cleidocranial Dysostosis: Report of Two Cases

CLEIDOCRANIAL dysostosis is rare. The syndrome includes imperfect ossification of the cranial and facial bones and aplastic defects in the clavicles. The patients are small and have shrunken facial bones and depressed nasal bridges. The skulls are large and the mandibles prognathic. Retardation of the development of teeth with high palatal arches are the rule. Anodontia and unusual root formations are common. Heredity is the only suspected etiologic factor. Two cases are reported, both in young soldiers, aged 25 and 21. The findings on both fitted, generally, into the above description. One, on examination, showed six maxillary and nine mandibular teeth with but two in occlusion. Several teeth in each jaw were unerupted. The other patient wore a full upper denture under which were several unerupted, partially developed teeth. Addi-

tional unerupted teeth were noted in the mandible.

Carcinoma of the Indifferent Cell Type Involving the Maxillae: Report of a Case

IN the words of the writer, "This report is of interest because of the youth of the patient, the benign appearance of the lesion and the difficulty in correlating the microscopic picture of the growth with the clinical findings." The patient, a woman, aged 25, had a painless "lump" over the upper right cuspid. The mass, apparently normal, was reduced in size at the time of removal of the tooth, as in an alveolotomy. The bone appeared normal at that time. The site failed to heal in the usual manner, but there was no ulceration and the area was diffusely enlarged and covered with a normal membrane except over the summit of the ridge, where the tissue was darker than the rest. Everything else was negative. An occlusal film of the area revealed bone porosity similar to malignancy. Biopsy produced a bizarre specimen identified as basal cell carcinoma, perhaps of odontogenic origin. Because of the lack of anaplasia, the mass was widely removed surgically without irradiation. Prognosis was considered good in view of the four years behind the lesion and the microscopic picture.

Restraining of Patients for General Anesthesia in Dental or Surgical Chairs

PATIENTS who receive general anesthesia in the sitting position require restraining devices different from those who are supine. Methods of holding the patient in the chair, utilizing ingenious straps are well illustrated.

Contagious Parotitis (Mumps) Coincidental with Tooth Extraction: Report of Case

THE patient, a woman, aged 27, developed a swelling over the parotid area several days after the removal of an unerupted upper third molar. Sulfonamide therapy was without effect. Soon the patient's child and then she herself developed mumps, this clarifying the case and establishing the diagnosis.

Industrial Lead Poisoning

TODAY, this industrial hazard occurs predominantly in the manufacture of red and white lead and in ship-breaking, where fumes are given off lead painted plates under the blowpipe flame. In other industries using lead, there has been a steady decline in the number of cases. This improvement is due to protective measures, better hygiene of the worker and early recognition of the disease by periodical medical examination and by accurate diagnostic methods.

Analyses of the lead content of the blood, urine and feces aid in diagnosis. Regarding punctate basophils, oldest diagnostic aid, hopes of their being a specific sign of either lead intoxication or absorption have faded. Stippled cells also occur in blood dyscrasis and in healthy persons without lead exposure, and the frequency in workmen with known exposure to lead and significant amounts of lead in the urine may be no greater than "normal." More than 9,000 stippled cells per million are necessary for the diagnosis to be considered positive, but 1,000 per million, in the absence of other known causes, suggests lead absorption.

The clinical picture remains classical. The familiar "dropped wrist" is usually a late manifestation of chronic poisoning. The "blue line" on the gums is not evidence of lead poisoning, but only of severe exposure. It is never found in the absence of teeth or in a completely clean and healthy mouth.—*Brit. M. J.*, 2:515, October 23, 1943.

PAUL H. KEYES.

Tuberculosis of the Buccal Mucous Membrane

By A. V. WEINBERGER

TUBERCULOUS involvement of the oral mucosa is relatively rare, being found in about 1.5 per cent in a series of 1,500 patients with pulmonary tuberculosis. Tuberculosis of the mouth occurs, very rarely, as a primary infection and as a secondary manifestation of foci elsewhere in the body. Oral tuberculosis occurs more frequently in men than in women, the ratio being 4:1. There are the ulcerative, miliary and infiltrative types, the first being most common. It begins as a collection of miliary tubercles, which caseate and coalesce, leaving shallow ulcers. The typical ulcer is superficial with little or no infiltration or induration and is cov-

ered by a "moth-eaten," grayish exudate. Mixed infection, with other bacteria, usually produces ulceration with an associated edema and pallor of the mucosa. It is believed that infection occurs by circulatory transmission by way of the blood or lymphatics. Differential diagnosis may be difficult. Syphilitic and neoplastic lesions should be considered.—*Am. J. Digest. Dis.*, 10: 421, November 1943.

S. J. FANALE.

A Different Concept of Reactions Following Sulfathiazole Readministration

By R. C. GREEN *et al.*

A SERIES of fifty-five patients were given an initial course of sulfathiazole without reaction. This was followed by readministration of the same drug after an interval of nine or more days between the last day of the initial course and the first day of the repeat course. Of the fifty-five patients, six manifested drug reactions during readministration, half of which were febrile. Similarly, thirty reactions occurred among a previous group of 300 patients receiving a single course of sulfathiazole. No reaction was of greater severity than that commonly seen in the initial course. It appears that readministration of sulfathiazole is more dangerous than the initial use. The evidence leads to the belief that most of the reactions of sulfathiazole readministration are not necessarily manifestations of hypersensitivity. —*Mil. Surgeon*, 93:399, November 1943.

S. J. FANALE.

Fluoride Ingestion and Bone Changes in Experimental Animals

By J. LARGENT *et al.*

LITTER-MATE female rabbits were fed diets containing fluoride (12-50 mg. per kilogram per day) for a period of from sixteen to ninety-two days. Although roentgenographic examination failed to reveal the presence of early bone changes, macroscopic bone changes developed in every animal and the fluorine content of the skeleton greatly increased.

The mandible frequently showed gross bone changes ranging from small wartlike exostoses to extensive general deposits. Numerous areas of porous bone (from 1 to 10 mm. in diameter) were scattered throughout the vertebrae and over the cranium, zygoma, maxillae and bones of the nose and pharynx. In the mandible, there was also marked bulging, most pronounced on the medial surface below the margin of the molar teeth.

The new bone resulting from the high absorption of fluorine by rabbits has a nonspecific basic architecture, resembling callus formation after fractures.—*J. Indus. Hyg. & Toxicol.*, 25:396, November 1943.

PAUL H. KEYES.

Studies in Vitamin B Deficiency

By A. G. CLARKE and F. PRESCOTT

WITH special reference to oral and mental manifestations, seventeen cases of vitamin B complex deficiency are reported. All patients showed signs of nicotinic acid deficiency: glossitis and mental symptoms. Nearly all showed angular stomatitis (cheilosis), which originally was considered a specific sign of ariboflavinosis, but which may not always be related to nutritional disease. Signs of peripheral neuritis, vitamin B_1 deficiency, were present in only four cases.

The striking features were the regular occurrence of oral lesions (very red, dry sore tongue, with flattened papillae, sometimes swollen and fissured; angular stomatitis, with cracked and fissured lips) and the psychoneurotic symptoms. Vitamin B therapy was followed by complete recovery.—*Brit. M. J.*, 2:503, October 23, 1943.

PAUL H. KEYES.

Congenital Malformations Induced in Rats by Maternal Nutritional Deficiency

By J. WARKANY and E. SCHRAFFENBERGER

CONGENITAL malformations were observed in the offspring of female rats fed diets lacking in riboflavin. The malformations consisted of shortness of the mandible, protrusion of the tongue, cleft of the palate, shortness of the tibia, fibula, radius and ulna, fusion of ribs and sternal centers of ossification, syndactylism and brachydactylism.—*Proc. Soc. Exper. Biol. & Med.*, 54: 92, October 1943.

PAUL H. KEYES.

Reaction of Leukemic Patients to the Sulfonamides

By E. L. AMIDON

FOUR cases of lymphatic leukemia were treated by administration of sulfanilamide and sulfathiazole. All four cases showed a drop in the total lymphocyte count. Two of the patients were in a moribund state and one was at the point of death on admission, yet each reacted promptly to the therapy. Although all eventually died, there was temporary clinical improvement in three cases.—*J. Lab. & Clin. Med.*, 28: 1691, November 1943.

PAUL H. KEYES.

Incidence of Dental Caries Among Aviation Cadets

By WILLIAM W. SENN

CAREFUL clinical examinations were made of more than 7,000 aviation cadets between the ages of 18 and 27 years, and records made of all carious, restored and missing teeth. Men from the Atlantic and Pacific coastlines both showed a relatively high incidence of caries, those from the central and midwestern states a considerably lower incidence. Men from Washington had the highest caries index and those from Texas the lowest. Maps are presented which lead to the possible conclusion that those cadets coming from areas where the fluorine content of the drinking water is high show the lowest incidence of dental caries. This is further evidence in favor of the fluorine-caries prevention theory. One feature worthy of note is that aviation cadets represent the most physically fit members of their age group, all coming from at least average environments, and having adequate opportunities for dental care.—*Mil. Surgeon*, 93:461, December 1943.

DAVID B. SCOTT.

Plastic Surgery as Related to War Surgery

By M. L. D. KIRKHAM, J. T. MILLS and L. E. POTTER

THE conversion of military hospitals from a peace-time to a war-time operating basis has made many changes necessary in the treatment of patients needing plastic repair. Surgical personnel are now being rapidly trained in the essentials of immediate care, thick split skin grafts and the principle of the z plastic. Such basic training, while it does not produce plastic surgeons, makes it possible for cases to be treated in emergencies when specialists are not available or transfer of patients to other base hospitals is not possible, and affords careful, intelligent over-all treatment planning. The differences in types of cases seen in civil and military hospitals are considerable, but there is little essential difference in plastic procedures. Burns resulting from aviation accidents are often complicated by multiple injuries, and their treatment has become a field of utmost importance. In other special types of military plastic cases, there are scars following shrapnel or other injuries and amputation stumps that need further treatment and salvaging of joints. Prosthesis is also important, with the manufacture of useful as well as cosmetic vinylite replacements. Special types of injury are discussed: burns, fractures about the nose, nasomaxillary process, zygoma and malar bones; partial or complete obliteration of the eye socket; eyelid deformities; extensive tissue loss about the face and ear deformities.—*S. Clin. N. America*, 23:1603, December 1943.

DAVID B. SCOTT.

Management of Jaw Fractures

By F. W. MERRIFIELD

THIS short paper, presenting an outline of the types of fractured jaw bones, aids in diagnosis and methods of treatment, evaluates methods of reduction and fixation and places emphasis upon the need for proper care and débridement of the soft tissues, retention if possible of teeth in the line of fracture, careful manipulation, avoidance of complications and adequate nutrition.—*Radiology*, 41:539, December 1943.

DAVID B. SCOTT.

Syphilis—A Review of the Recent Literature

By F. W. REYNOLDS, C. F. MOHR and J. E. MOORE

THIS lengthy and comprehensive review includes a section on dental changes in congenital syphilis. The formation of dwarfed and deformed permanent upper central, lower central and lateral incisors and first molars is described. Convergent proximal

surfaces and crowded cusps are the most notable features. Comparison of ground sections of Hutchinson's teeth and normal incisors revealed differences in the form of the dentino-enamel junction, but no significant histologic differences. This paper reviews more than 200 publications appearing between July 1942 and June 1943, and brings the reader's information up to date. —*Arch. Int. Med.*, 72:635, November 1943.

DAVID B. SCOTT.

Three New Tools of Science

By DOUGLAS F. WINNEK

THE perception of depth, color and apparent motion can be achieved on a single sheet of regular color film that has been embossed on its base side with microscopic lenticulations, approximately 200 to the inch. The camera, a simple box, has the lens fixed to the front panel and a sliding film carrier on the back. During exposure, the camera slides laterally in front of the subject, the lens moving parallel to the subject, plane in focus, and the film carrier traveling faster to keep the continuous panoramic series of images centered on the film. When the film is placed in the camera, base side toward the lens, successive images of the subject are projected onto the lenticular film surface and are reduced to a multiplicity of contracted picture elements.

The successive picture records are thus isolated to produce a composite stereograph. The camera is automatic and one merely inserts the film and presses the button. No change in film processing is necessary. Viewing the film through the lenticular side, the observer will see the subject in three dimensions. Such actions as jaw movements and muscle contraction have been recorded and studied in three dimensions.—*New York J. Med.*, 43:1986, October 15, 1943.

PAUL H. KEYES.

Local Application of Sulfanilamide Powder in Radiotherapy

By A. A. CHARTERIS

IN the application of radiotherapy, it is often necessary to administer antiseptics, especially in cases of superficial ulcerating growths, tumors of the nose and accessory sinuses, etc. An important field is left open for the use of sulfonamides, especially when the parts are to be left dry and the powdered drug can be used. The most general application is in the care of unbroken skin undergoing a dry reaction after radiotherapy. For the prevention of moist desquamation, sulfanilamide powder can be used. This eliminates the risk of formation of chronic pustules. After maximal irradiation wherein an adequate "tumor dose" has been delivered, moist desquamation is inevitable. The affected part is covered with moistened protective gauze, which is allowed to dry in position, and the powder is then dusted on. Where a superficial tumor with ulceration is present, sulfanilamide powder is useful to control sepsis and to limit reaction by keeping the part as dry as possible.—*Brit. M. J.*, 2: November 6, 1943.

S. J. FANALE.

Demerol, a New Departure in Analgesia: An Evaluation of Present Therapeutic Claims

By ROBERT HOFFMAN

WHEN compared with demerol, analgesic drugs such as the salicylates, acetanilid and aminopyrine may be dismissed, since they are somewhat specific in the types of pains relieved, and their analgesic strength is but a fraction of that possessed by demerol. Sodium salts of barbituric acid are more potent analgesics, but their hypnotic powers are more dominant than their analgesic properties, besides which they tend to affect blood-making organs. Codeine has an analgesic index far below that of demerol, and morphine is the only practical analgesic that rivals demerol. The action of this drug is threefold: (1) sedative, (2) analgesic and (3) spasmolytic. Its sedative effect is only moderate and the combination of a low sedative ratio and high analgesic index makes it an ideal drug for ambulatory patients. Demerol effectively relaxes the smooth muscle of the gastro-intestinal tract, uterus, etc. It inhibits segmental peristalsis of the gut, and seems to activate propulsive peristalsis. Oral administration has been found to be almost as effective as injection. Demerol does not affect blood pressure or blood sugar levels. It has no effect on the hemoglobin and cell counts. Like the average analgesic, it can be given every four hours

without cumulative action.—*Cur. Res. Anes.-Analg.*, 22:336, November-December 1943.

S. J. FANALE.

Oncocytoma of the Parotid Gland

By L. V. ACKERMAN

ONCOCYTES are epithelial cells resembling those of the organ in which they are found, tending to be large, with acidophilic granular cytoplasm. There is a similarity between the nuclei of the oncocytes and those of cells from the parent organ. The oncocytes give rise to nodular hyperplasia, at times being the source of the tumor known as oncocytoma. The usual sites are the anterior and posterior lobes and the stalk of the hypophysis, the salivary glands, thyroid and parathyroid glands, etc. The case reported is an oncocytoma of the parotid. There are only a few well-documented cases of this nature. The tumor usually occurs in the older age group, average age 72 years (oncocytes are found with increasing frequency between the ages of 20 and 60, being invariably present after 60). Removal should be radical, with inclusion of practically the entire salivary gland. They are slow growing, never large or attached to skin or bone and usually quite firm. They either have no capsule or have an incomplete connective tissue capsule. Metastases have never been reported.—*Arch. Path.*, 36: 508, November 1943.

S. J. FANALE.

Actinomycosis Treated with Sulfadiazine

By W. F. HOLLENBECK and D. TURNOFF

THE authors report the treatment of cervicofacial actinomycosis with sulfadiazine. After diagnosis, the patient was given this drug by mouth in 1 gm. doses every four hours. One week later, the quantity was cut to 1 gm. four times daily. After two weeks, noticeable improvement was apparent, and ensuing weeks of treatment caused a disappearance of the abscesses. The scars dissolved, leaving the skin practically normal. Treatment was continued for 120 consecutive days. The patient suffered no ill-effects and received no other medication. Emphasis must be placed on long-continued drug therapy and the ever-present danger of recurrences.—*J.A.M.A.*, 123:1115, December 25, 1943.

S. J. FANALE.

Rhinoscleroma—Report of a Case

By ELLIS KELLERT

BEGINNING in the anterior nares, rhinoscleroma, a chronic granuloma of the upper respiratory tract, slowly spreads to the lip, nose, pharynx, palate, larynx and trachea. This infiltrative, inflammatory process may be combined with or replaced by sclerosis, atrophy and scarring of the mucosa. The dominant gross features are hard, infiltrated tissues, hard, granular, atrophic mucous membranes that bleed easily on manipulation and a marked fetid odor. It may be confused with cancer, tuberculosis or syphilis. Microscopically, one see encapsulated gram-negative bacilli in the large endothelial cells and the constant presence in ordinary cultures of *Klebsiella rhinoscleromatis*.—*New England J. Med.*, 229:643, October 21, 1943.

S. J. FANALE.

Technic for Apicoectomy with Immediate Root Filling

By S. S. SHAPIRO and E. B. MASTER

IN the selection of suitable cases, the authors are more concerned with the extent of alveolar absorption than the amount of osseous destruction about the apex of the tooth. The pulp chamber is emptied and apicoectomy is then performed. The type of flap is of minor importance. The apex is exposed by removing the overlying bone with appropriate burs or chisel. The apex is cut off, the cut end smoothed and the infected tissue removed. The remainder of the pulp is now extirpated, and the canal is slightly enlarged and straightened. It is then properly sterilized, dried and filled. The area of operation is irrigated and the incision closed. —*Mil. Surgeon*, 93:368, October 1943.

S. J. FANALE.

ANNOUNCEMENTS

ANNOUNCEMENTS must be received by the fifth of the month in order to be published in the forthcoming issue of THE JOURNAL.

CALENDAR OF MEETINGS

ALPHA OMEGA DENTAL FRATERNITY, Chicago, Ill., February 20.

AMERICAN ACADEMY OF PLASTICS RESEARCH IN DENTISTRY, Chicago, Ill., February 20.

AMERICAN ACADEMY OF RESTORATIVE DENTISTRY, Chicago, Ill., February 19-20.

AMERICAN ASSOCIATION OF DENTAL EDITORS, Chicago, Ill., February 21.

AMERICAN ASSOCIATION OF ORTHODONTISTS, Chicago, Ill., April 25-27.

AMERICAN BOARD OF ORTHODONTICS, Chicago, April 23-24.

AMERICAN SOCIETY FOR THE ADVANCEMENT OF GENERAL ANESTHESIA IN DENTISTRY, New York, N. Y., March 27.

AMERICAN SOCIETY OF ENDODONTISTS, Chicago, Ill., February 23-24.

CHICAGO DENTAL SOCIETY, February 21-23.

CLEVELAND DENTAL SOCIETY, May 8-10.

DISTRICT OF COLUMBIA DENTAL SOCIETY, second Tuesday in each month, at the Medical Society Auditorium, Washington.

THOMAS P. HINMAN MID-WINTER CLINIC, Atlanta, Ga., March 26-28.

NATIONAL BOARD OF DENTAL EXAMINERS, May 1-2.

NEW YORK SOCIETY OF ORTHODONTISTS, New York, March 6-7.

GREATER PHILADELPHIA ANNUAL MEETING, February 2-4.

SOUTHWESTERN SOCIETY OF ORTHODONTISTS, Shreveport, La., February 28-March 2.

STATE SOCIETIES

March

Minnesota, at St. Paul (1-3)
Wisconsin, at Milwaukee (20-22)

April

Alabama, at Birmingham (10-13)
Kentucky, at Louisville (3-5)
Louisiana, at Shreveport (13-15)
Michigan, at Detroit (17-19)
Mississippi, at Jackson (23-25)
Missouri, at Jefferson City (24-26)
South Carolina, at Columbia (24-25)
Virginia, at Richmond (3-5)

May

Georgia, at Atlanta (7-10)
Illinois, at Springfield (8-11)
Montana, at Billings (4-6)
New York, at Buffalo (9-12)
North Carolina, at Raleigh (1-3)
Tennessee, at Memphis (22-25)

STATE BOARDS OF DENTAL EXAMINERS

Indiana, at Indianapolis, April 24-27. Carl A. Frech, Gary National Bank Bldg., Gary, Secretary.

Ohio, at Columbus, practical examination, February 28-March 1 (dental), February 29 (dental hygiene); theory, March 2-4. Earl D. Lowry, 79 E. State St., Columbus 15, Secretary.

ALPHA OMEGA DENTAL FRATERNITY

ALPHA Omega Dental Fraternity will have headquarters at the Palmer House during the Midwinter Meeting of the Chicago Dental Society, February 21-23. The annual preconvention dinner will be given February 20 at 7 p.m., in the Hollywood Room of the Morrison Hotel.

B. P. DAVIDSON,
3324 Diversey Ave.,
Chicago, Ill.

AMERICAN ACADEMY FOR PLASTICS RESEARCH IN DENTISTRY

THE annual meeting of the American Academy for Plastics Research in Dentistry will be held February 20 in Dining Room 14, Palmer House, Chicago.

LAMAR W. HARRIS, *Secretary*,
25 E. Washington St.,
Chicago 2, Ill.

THE AMERICAN ACADEMY OF RESTORATIVE DENTISTRY

THE American Academy of Restorative Dentistry will hold its annual meeting at the Palmer House, Chicago, Ill., February 19 and 20.

W. SAMUEL TUCKER,
Secretary-Treasurer,
940 Canal Building,
New Orleans 12, La.

AMERICAN ASSOCIATION OF DENTAL EDITORS

AN informal meeting of the American Association of Dental Editors will be held February 21 at the Palmer House, Chicago, 10:00 a.m. to 1:30 p.m.

O. W. BRANDHORST, *Secretary,*
4952 Maryland Ave.,
St. Louis, Mo.

AMERICAN ASSOCIATION OF ORTHODONTISTS

THE next meeting of the American Association of Orthodontists will be held at the Edgewater Beach Hotel, Chicago, Ill., April 25, 26, 27. Members of the American Dental Association are invited to attend this meeting upon the presentation of proper credentials and payment of the registration fee. Credentials should be obtained in advance from the secretary of the American Association of Orthodontists or a secretary of a constituent orthodontic society.

MAX E. ERNST, *Secretary,*
1250 Lowry Medical Arts Building,
St. Paul 2, Minn.

AMERICAN ASSOCIATION OF ORTHODONTISTS RESEARCH SECTION

AT the present time, there is no opportunity afforded men interested in orthodontic research to meet to discuss their problems. At the last meeting of the American Association of Orthodontists, it was proposed that the Research Committee be empowered to arrange a portion of the program for the next annual meeting, to be held in Chicago, April 25-27.

The program will consume one-half day and will be restricted to ten or fifteen minute reports by men actively engaged in research in orthodontia or its allied fields. Time will be allowed for discussion of all presentations, in order that the greatest benefit may accrue to those participating. All institutions and all individuals are invited to request time.

For further information or time reservations on the program, address

ALLAN G. BRODIE, *Chairman,*
Research Committee, A. A. O.,
30 North Michigan Ave.,
Chicago, Ill.

AMERICAN BOARD OF ORTHODONTICS

THE 1944 meeting of the American Board of Orthodontics will be held at the Edgewater Beach Hotel, Chicago, Ill., April 23 and 24. Orthodontists who may desire to be certificated by the Board can obtain application blanks from the secretary, Bernard G. deVries, 705 Medical Arts Bldg., Minneapolis, Minn.

AMERICAN SOCIETY FOR THE ADVANCEMENT OF GENERAL ANESTHESIA IN DENTISTRY

THE Spring meeting of the American Society for the Advancement of General Anesthesia in Dentistry will be held Monday evening, March 27 at the National Republican Club, 54 W. 40th St., New York, N. Y. James R. Cameron, of Philadelphia, will preside. George F. Seeman, of Nashville, Tenn., will present a paper dealing with administration of anesthetics in dentistry. Members of the profession are invited.

M. HILLEL FELDMAN, *Secretary,*
730 Fifth Ave.,
New York, N. Y.

AMERICAN SOCIETY OF ENDODONTISTS

THE American Society of Endodontists, an organization for the study of root canal therapy, will hold its first annual meeting at the Palmer House, Chicago, Wednesday evening and all day Thursday, February 23-24. Members of the American Dental Association are invited.

JOHN H. HOSPERS, *Secretary,*
Marshall Field Annex,
Chicago, Ill.

CHICAGO DENTAL SOCIETY ANNUAL MIDWINTER MEETING

THE Eightieth Annual Midwinter Meeting of the Chicago Dental Society will be

held February 21-23, at the Palmer House.

HARRY A. HARTLEY, *Secretary,*
30 N. Michigan Ave.,
Chicago 2, Ill.

CLEVELAND DENTAL SOCIETY ANNUAL SPRING CLINIC MEETING

THE Annual Spring Clinic Meeting of the Cleveland Dental Society will be held at the Hotel Carter, May 8-10.

H. C. ALEXANDER,
Windermere Theatre Bldg.,
East Cleveland, Ohio.

DISTRICT OF COLUMBIA DENTAL SOCIETY

THE District of Columbia Dental Society holds its meetings on the second Tuesday of every month, at the Medical Society Auditorium, 1718 M. St., N.W., Washington.

J. WALTER BERNHARD, *Secretary,*
1835 Eye St., N.W.,
Washington.

THE THOMAS P. HINMAN MID-WINTER CLINIC

THE Thomas P. Hinman Mid-Winter Clinic will be held at the Municipal Auditorium, Atlanta, Georgia, March 26, 27, 28.

S. A. GARRETT, *Chairman,*
302 Medical Arts Building,
Atlanta, Ga.

NATIONAL BOARD OF DENTAL EXAMINERS

THE following are the dates for the next examinations of the National Board of Dental Examiners: May 1-2. Applications should be sent through deans.

GORDON L. TEALL, *Secretary.*

NEW YORK SOCIETY OF ORTHODONTISTS

THE annual or spring meeting of the New York Society of Orthodontists will be held at the Waldorf-Astoria Hotel, New York, March 6-7.

NORMAN L. HILLYER, *Secretary,*
Professional Bldg.,
Hempstead.

GREATER PHILADELPHIA ANNUAL MEETING

THE Greater Philadelphia Annual Meeting will be held February 2-4, 1944 at the Benjamin Franklin Hotel.

JOHN P. LOOBY, *Chairman,*
Publicity Committee.

SOUTHWESTERN SOCIETY OF ORTHODONTISTS

THE Twenty-Fourth Annual Meeting of the Southwestern Society of Orthodontists will be held in Shreveport, La., February 28-March 2, at the Washington-Youree Hotel.

JAMES O. BAILEY, *Secretary,*
Hamilton Bldg.,
Wichita Falls, Texas.

ALABAMA DENTAL ASSOCIATION

THE annual meeting of the Alabama Dental Association will be held at the Tutwiler Hotel in Birmingham, April 10-13.

PRYOR A. WILLIAMS, *Secretary,*
1005 Protective Life Bldg.,
Birmingham.

GEORGIA DENTAL ASSOCIATION

THE seventy-sixth annual meeting of the Georgia Dental Association will be held in Atlanta, May 7-10, with headquarters at the Ansley Hotel.

R. H. MURPHY, *Secretary,*
605 Bankers Insurance Bldg.,
Macon.

ILLINOIS STATE DENTAL SOCIETY

THE next meeting of the Illinois State Dental Society will be held in Springfield, May 8-11.

L. H. JACOB, *Secretary,*
Jefferson Bldg.,
Peoria 2.

KENTUCKY STATE DENTAL ASSOCIATION

THE eighty-fourth annual meeting of the Kentucky State Dental Association will be held at the Brown Hotel, Louisville, April 3-5.

J. L. WALKER, *Secretary,*
640 Barbee Way South,
Louisville.

LOUISIANA STATE DENTAL SOCIETY

THE next meeting of the Louisiana State Dental Society will be held April 13-15, at the Washington-Youree Hotel, Shreveport.

MICHIGAN STATE DENTAL SOCIETY

THE Eighty-Eighth Annual Meeting of the Michigan State Dental Society will be

held at the Hotel Statler, Detroit, April 17-19.

S. G. APPLEGATE,
General Chairman,
630 E. Jefferson Ave.,
Detroit.

MINNESOTA STATE DENTAL ASSOCIATION

THE sixty-first annual session of the Minnesota State Dental Association will be held in the Municipal Auditorium, St. Paul, March 1-3. All members of the American Dental Association are invited to attend.

L. M. CRUTTENDEN, *Secretary,*
498 Lowry Bldg.,
St. Paul.

MISSISSIPPI DENTAL ASSOCIATION

THE Mississippi Dental Association will hold its sixty-ninth annual meeting at the Robert E. Lee Hotel, Jackson, April 23-25.

O. L. COLEE, *Secretary,*
Magnolia.

MISSOURI STATE DENTAL ASSOCIATION

THE next meeting of the Missouri State Dental Association will be held at Jefferson City, April 24-26, at the Governor Hotel.

C. W. DIGGES, *Secretary,*
Exchange National Bank Bldg.,
Columbia.

MONTANA STATE DENTAL ASSOCIATION

THE 1944 meeting of the Montana State Dental Association will be held in Billings, May 4-6.

T. T. RIDER, *Secretary,*
9 Higgins Block,
Missoula.

DENTAL SOCIETY OF THE STATE OF NEW YORK

THE Seventy-Sixth Annual Meeting of the Dental Society of the State of New York will be held in Buffalo, at the Hotel Statler, May 9-12.

PERCY T. PHILLIPS,
Press and Publication Committee,
18 E. 48th St.,
New York 17.

NORTH CAROLINA DENTAL SOCIETY

THE Seventieth Annual Meeting of the North Carolina Dental Society will be held at the Hotel Sir Walter Raleigh, May 1-3.

E. M. MEDLIN, *Secretary,*
Aberdeen.

SOUTH CAROLINA STATE DENTAL ASSOCIATION

THE next meeting of the South Carolina State Dental Association will be held at the Columbia Hotel, Columbia, April 24-25.

L. E. DELLINGER, *President,*
Greenville.

TENNESSEE STATE DENTAL ASSOCIATION

THE next annual meeting of the Tennessee State Dental Association will be held at the Hotel Peabody, Memphis, May 22-25.

E. JEFF JUSTIS, *Secretary,*
1504 Exchange Bldg.,
Memphis.

VIRGINIA STATE DENTAL ASSOCIATION

THE Virginia State Dental Association will hold its next annual meeting April 3-5, at the John Marshall Hotel, Richmond.

J. E. JOHN, *Secretary,*
Medical Arts Bldg.,
Roanoke.

WISCONSIN STATE DENTAL SOCIETY

THE Wisconsin State Dental Society will hold its seventy-fourth annual convention at the Hotel Schroeder, Milwaukee, March 20-22. A meeting of the executive council and house of delegates will precede the general convention March 19.

KENNETH F. CRANE, *Secretary,*
1233 Bankers Bldg.,
Milwaukee.

INDIANA STATE BOARD OF DENTAL EXAMINERS

THE Indiana State Board of Dental Examiners will hold its next examination in Indianapolis, April 24-27. All credentials and fees must be filed with the secretary at least two weeks prior to the examination.

CARL A. FRECH, *Secretary,*
Gary Nat'l Bank Bldg.,
Gary.

OHIO STATE DENTAL BOARD

THE next practical examination of the Ohio State Dental Board will be held at Ohio State University College of Dentistry, Columbus, February 28-March 1. The practical examination for dental hygienists will be given February 29. The theory examination for both dental and dental hygiene applicants will be held in Columbus, March 2-4. Applications for these examinations must be in the hands of the secretary not later than February 18 and no application will be accepted after that date. For further information, apply to

EARL D. LOWRY, *Secretary,*
79 E. State St.,
Columbus 15.

PAN AMERICAN ODONTOLOGICAL ASSOCIATION SCHOLARSHIP

THE Pan American Odontological Association takes pleasure in announcing an annual scholarship at the Tufts College Dental School, Boston, Mass., for graduate dentists from any of the Latin American countries. The subjects of study include: complete denture prosthesis, partial denture prosthesis, minor oral surgery, operative dentistry, ceramics, children's dentistry, root surgery and radiology, preventive dentistry and treatment of parodontal diseases.

This annual scholarship is an addition to the already available Pan American Odontological Association scholarships at the New York University, College of Dentistry; Evans Dental Institute, School of Dentistry, University of Pennsylvania, and the W. K. Kellogg Foundation Institute, Graduate and Postgraduate Dentistry, University of Michigan.

RALPH HOWARD BRODSKY, D.M.D.,
Executive Secretary,
14 East 81st St.,
New York 28, N. Y.

VOLUNTEERSHIPS AND EXTERNSHIPS, BRONX HOSPITAL

THERE are several volunteerships and externships available for recent graduates at the dental clinic, Bronx Hospital, in the following departments: oral surgery and exodontia, operative dentistry, orthodontia, surgical periodontia and root canal therapy. Applicants address David Wurzel, director of the Dental Department, Bronx Hospital, 169th St. & Fulton Ave., Bronx, New York.

DENTAL INTERNSHIPS

Two internships are available at the St. Louis City Hospital for recent dental graduates. Opportunity is afforded for training and experience in dental and oral surgery, diagnosis and other phases of dentistry. Applicants should address Leo J. Wade, Medical Director, or Hamilton B. G. Robinson, D.D.S., City Hospital, 1515 Lafayette Ave., St. Louis, Mo.

DENTAL INTERNSHIPS

THE Greater New York Conference of Hospital Dental Services, comprised of a group of men who are chiefs of dental services, would like to aid those men seeking dental internships in hospitals in the metropolitan area. Those who are not in the Army or the Navy and who are desirous of obtaining internships should communicate with

MARY E. REILLY, *Secretary,*
386 Fourth Ave.,
New York, N. Y.

UNIVERSITY OF CALIFORNIA RESEARCH ASSISTANT

THE College of Dentistry University of California has an appointment as research assistant available for a qualified person beginning June 30. The appointment is in the Division of Dental Medicine and is for one year. This may be extended for an additional year.

This appointment is designed primarily for dental graduates with an interest in dental research and teaching. However, this dental degree requirement can be waived if other qualifications justify it.

The basic salary is $1,500 a year, plus an emergency increase to care for added living costs.

Application forms may be obtained from the Dean of the College of Dentistry, University of California, San Francisco, Calif.

WILLARD C. FLEMING, *Dean.*

PRIZE ESSAY CONTEST

THE Research Committee of the American Association of Orthodontists has been

empowered by the board of directors to conduct a prize essay contest. The prize has been set at $200, and will be offered annually until further notice. The terms of the competition are as follows:

ELIGIBILITY

Any student enrolled in a recognized university, or any person who has completed his or her formal education in orthodontia not more than three years prior to January 1, is eligible to compete for the prize.

ESSAY

The essay must represent a piece of original research having a direct bearing on the field of orthodontia. It may relate either to a biologic or a clinical problem and may represent material that has been offered in partial fulfilment of the requirements for a graduate or postgraduate degree, or any graduate, postgraduate or undergraduate contest. Papers previously submitted and now published or in press will be accepted for the present contest. All essays must be in the hands of the committee by February 1. If no essay is deemed worthy by the committee, the prize will be withheld.

AWARD

The prize-winning essay will be accorded a place on the scientific program of the annual meeting of the association, at which time the prize will be awarded. The association will retain publication rights on the first three choices.

For further information, address

ALLAN G. BRODIE, *Chairman*,
Research Committee, A. A. O.,
30 North Michigan Ave.,
Chicago, Ill.

UNIVERSITY OF ILLINOIS RESEARCH FELLOWSHIPS

APPLICATIONS for Research Fellowships in Medicine, Dentistry and Pharmacy in the University of Illinois are now being considered for the year beginning September 1, 1944. Appointments to these Fellowships will be announced January 1.

Candidates for these Fellowships must have completed a training of not less than eight years beyond high school graduation. The Fellowship carries a stipend of $1,200 per calendar year with one month's vacation.

Application blanks and further information can be secured from the secretary of the Committee on Graduate Work in Medicine, Dentistry and Pharmacy, 1853 West Polk St., Chicago 12, Ill.

CARNEGIE FELLOWSHIPS FOR RESEARCH AND GRADUATE WORK IN THE DENTAL SCIENCES

AIDED by the Carnegie Corporation of the New York and the Eastman Dental Clinic, the School of Medicine and Dentistry of the University of Rochester offers scholarships paying $1,200-$1,800 per annum to well-trained dental graduates who are interested in research or who desire special training in the basic medical sciences as an aid to dental teaching or practice. A few fellowships also offer part-time training in oral surgery. On appointment, the applicant is given the title of Fellow in Dentistry and, acording to his interests, works as a graduate student in one of the departments of the medical schools. Here, excellent laboratory facilities, adequate direction and close contact with various investigations related to medicine and dentistry help his research and study. Fellows are encouraged to attend medical classes, seminars and staff meetings and, when opportunity presents itself, to participate in class instruction and scientific meetings. Contact with the problems of clinical dentistry may be maintained through the Oral Surgery Clinic of the Strong Memorial Hospital and the Rochester Dental Dispensary. With the approval of the Graduates Council of the university, Fellows may prepare themselves for the degree of M.S. or Ph.D. Applications should be made to

GEORGE H. WHIPPLE, *Dean*,
Rochester, N. Y.

UNITED STATES PATENTS APPLICABLE OR PERTAINING TO DENTISTRY ISSUED DURING NOVEMBER AND DECEMBER 1943

November 2

2,333,357, RUDOLPH H. BRUNI. Dentist's apron holder.

2,333,430, PYUNGTOO WILLIAM LEE AND CHARLES DIETZ. Dental investment material.

November 9

2,333,679, IRI C. SCHOONOVER AND GEORGE R. DICKSON. Process for protecting plastics during curing or molding.

2,333,795, ERNEST KELLERMAN AND MAX O. DUKAS. Demonstration kit for mechanical dentistry.

2,333,833, FREDERICK TRYFUS. Method and means for producing dental work.

2,334,078, ELLIOTT M. FEINBERG. Apparatus for casting dental restorations.

D-136,631, BERNARD BERNARD AND BRUNO W. KIRSCHNER. Design for a toothbrush or similar article.

D-136,632, BERNARD BERNARD AND BRUNO W. KIRSCHNER. Design for a toothbrush.

November 16

2,334,214, SIMON MYERSON. Carding device for artificial teeth.

2,334,315, EDWARD L. CHOTT. Dental amalgamator.

2,334,319, REINER W. ERDLE. Ceramic denture material and denture or denture part.

2,334,643, THOMAS R. MOORE. Dental articulator and method for orienting casts thereon.

November 23

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